

Appendix A

SUMMARY OF SWMUs DESIGNATED AS NO FURTHER ACTION

SWMU 2-1: BOTTOM/FLY ASH UNITS J-3, J-4, AND J-5

Prior to 1975, fly/bottom ash was collected in a dust collection system at the powerhouse. Subsequent to 1975, fly ash was collected in electrostatic precipitators. Subsequent to 1982 fly ash was collected in the electrostatic precipitators and in a bag house, located at the on-site coal-fired power plant. These operations are the major source of waste disposed in SWMU 2-1.

SWMU 2-1 is comprised of landfill cell Units J-3, J-4, and J-5. Units J-4 and J-5 are state-permitted to receive fly/bottom ash generated at the power plant. Units J-3 and J-4 are included in the RFI. Unit J-5 actively receives fly ash and therefore was not included in the RFI.

Units J-3 and J-4 accepted bottom ash from the power facility until 1975 and were filled prior to the opening of J-5 in November 1975. Units J-3 and J-4 are covered with 6 inches of soil and vegetated. Diversion ditches prevent most surface water other than direct rainfall from contacting the landfill area.

An electromagnetic survey (RFI Phase 1, Task 1) was conducted at SWMU 2-1 in the fall of 1995 (ICF Kaiser, 1996d). Both quadrature and in-phase measurements were made on a 20-foot grid spacing over SWMU 2-1. The terrain (quadrature phase) conductivity and in-phase maps for this SWMU measured relative high and low conductivities within the landfill that are interpreted to represent variations in the thickness of buried ash material. However, EM anomalies are non-unique and other potential explanations include variations in moisture and ionic content.

Eleven test borings were advanced into the subsurface at SWMU 2-1 using a HSA drill rig and continuous split-spoon sampling. Seven of the 11 test borings were used to collect samples of the landfill material for laboratory analysis. Three test borings (02-TB-04, 02-TB-05, and 02-TB-06) were drilled within Unit J-4 to depths ranging between 20 and 30 ft-bgs to characterize the nature and thickness of the landfill materials, and to collect samples for laboratory analysis. Four borings (02-TB-07, 02-TB-08, 02-TB-09, and 02-TB-10) were drilled to depths ranging between 10 and 24 ft-bgs to collect samples for laboratory analysis and characterize Unit J-3. Samples for laboratory analysis were collected from each of the seven borings at surface (0 to 2 ft-bgs), 3 to 5 ft-bgs, and at the 2-foot interval immediately above the groundwater. A total of 23 samples (including duplicates) were submitted to RECRA Labnet for analysis of TAL inorganics, boron, PAHs, and pH. The surface (0 to 2 ft-bgs) soil samples collected at this SWMU consisted of a mixture of soil and fly/bottom ash. The subsurface samples consisted primarily of fly/bottom ash.

Analytical results indicated that there were five inorganic analytes with maximum detected concentrations exceeding the USEPA SSLs. Organic compounds were not detected in concentrations exceeding the USEPA SSLs. Two inorganic analytes (arsenic and beryllium) were detected at concentrations exceeding both the Region III RBCs for industrial and residential soil, and three inorganic analytes (barium, iron and lead) were detected in concentrations exceeding RBCs for residential soil only. Organic compounds showed no detections exceeding the RBCs for industrial soil, and one detection (benzo(a)pyrene) exceeding the residential RBC.

Arsenic, antimony, barium, beryllium, chromium, iron and thallium concentrations exceed the screening criteria in both J-3 and J-4 in samples collected from surface (0 to 2 ft-bgs) and various subsurface depths. Lead was detected above the residential RBC in only one location (02-TB-07) on the eastern perimeter of J-3 in the 0 to 2 foot interval.

The constituents with maximum concentrations greater than the residential RBCs are not considered to be of concern because the land use is industrial. The two inorganic analytes detected in SWMU 2-1 at concentrations exceeding the industrial RBCs (arsenic and beryllium) are also present at concentrations that exceed background levels. The samples with levels of arsenic and beryllium exceeding background were composed primarily of flyash. Evaluation of samples collected from native material beneath the flyash show concentrations of arsenic and beryllium exceed the industrial RBC, but similar to the background concentrations observed in samples collected in Area 1. Results of the samples collected in SWMU 2-1 indicate that materials managed at the SWMU are contained within the SWMU boundaries. PPG trains the Natrium facility employees on the potential chemical hazards associated with flyash and therefore, arsenic and beryllium are not of concern at this SWMU.

No constituents were identified in SWMU 2-1 with detection limits exceeding the USEPA SSLs. No inorganics had detection limits exceeding the industrial or residential RBCs. Evaluation of the detection limits for organic compounds showed none exceeding the industrial RBCs, and two (benzo(a)pyrene and dibenzo(a,h)anthracene) exceeding the residential RBCs. Although some detection limits exceed the screening values, they are within those normally achievable by the analytical methods and are not considered elevated.

Site-specific SSLs were derived for SWMU 2-1 using site-specific data to further evaluate if the inorganics detected within the unsaturated zone at levels exceeding the USEPA SSLs could potentially migrate to groundwater at concentrations of concern. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL. The maximum detected concentration of each constituent was then compared to the site-specific SSL. The results of this comparison indicated that no constituents with maximum detected concentrations exceeded the site-specific SSLs. Based on this information SWMU 2-1 is recommended for no further action.

SWMU 2-2: Oil Storage Tank Area (for #3 Brine Field Development)

Two above-ground steel storage tanks located adjacent to one another were used to store oils related to salt cavity development. These tanks were active from 1966 until their removal in the fall of 1991. After removal of the tanks, three feet of soil was removed from the area beneath these tanks. This soil was shipped off-site for disposal. Each tank was approximately 20 feet long with an 8-foot to 10-foot diameter and a capacity between 1,000 and 2,000 gallons. The area is currently vegetated. Two rounds of investigation (May 1994 and October 1994) were conducted at SWMU 2-2 on a voluntary, accelerated schedule by PPG.

The results of the investigation were provided to USEPA in a document entitled "Interim Action and Investigation Report For Selected RFI SWMUs and AOCs" (ICF Kaiser, 1996b) and in an executive summary (ICF Kaiser, 1996e). The preliminary investigation of SWMU 2-2 consisted of the collection of four samples from one boring. The samples were collected at the following depth intervals: ground surface, 3 to 5 ft-below ground surface (bgs), 5 to 7 ft-bgs, 7 to 9 ft-bgs. These samples were analyzed for Total Organic Halogens (TOX), Total Petroleum Hydrocarbons (TPH), Target Compound List Polychlorinated Biphenyls (TCL PCBs), and lead.

A second round of investigation was performed at SWMU 2-2 and consisted of the completion of ten soil borings. Forty eight (48) soil samples were collected and analyzed on-site (i.e., field screened) for TPH. Splits of two of these soil samples (02-GP-03 / 24 to 26 bgs and 02-GP-02 / 0 to 0.5 ft-bgs) were analyzed for; Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX); Total Petroleum Hydrocarbons (TPH); and Semivolatile Organic Compounds (SVOCs) analysis.

The results of the sampling events revealed that the maximum detected concentration of TPH exceeds the screening value of 1,000 milligram (mg)/kilogram (kg) for industrial and residential soil. However, there are no specific TPH-related constituents of concern (i.e., VOCs, SVOCs, PCBs) detected at concentrations that exceed the residential or industrial risk-based concentrations (RBCs). The low concentrations of specific volatile organic compounds (VOCs), SVOCs, and PCBs to TPH concentrations that exceed the 1,000 mg/kg screening value is consistent with site-wide findings. Four organic constituents have maximum detection limits which exceed the Region III RBCs for residential soil, but the detection limits are within those normally achievable by the analytical methods.

Analytical data show TPH present at a maximum concentration exceeding 1,000 mg/kg in soil samples collected immediately above the water table near this SWMU. However, there are no detected constituents which exceed the default USEPA soil screening level (SSL).

Although the analytical results for SWMU 2-2 shows concentrations of TPH that exceed industrial screening criteria, the concentrations of specific constituents of concern associated with TPH (i.e., VOCs, SVOCs, and PCBs) are below the residential and industrial RBCs. Therefore, there is no concern related to the soil contact pathways. Comparison of the analytical data to the default USEPA SSLs shows the specific constituents of concern associated with TPH will not leach to groundwater at levels of concern. However, due to the detection of TPH at concentrations exceeding the 1,000 mg/kg value, PPG recommended in previous reports that this SWMU be further evaluated during the site-wide evaluation of groundwater. During Phase 3, three production wells (#37WW, #38WW, and #43WW) and monitoring well MW-4 were sampled. TPH and the associated organic constituents of concern were not detected at concentrations of concern in these wells. Based upon this evaluation, no further action is recommended at this SWMU.

SWMU 3-1: OIL/WATER SEPARATOR AREA

SWMU 3-1 formerly contained a steel vessel used to separate waste oil and condensate water generated by the liquefied ammonia process. Operation of the oil/water separator unit began in 1956. The unit was dismantled in conjunction with the demolition of the Ammonia plant in 1995. Portions of the area were contained by concrete pads and six-inch concrete diking. The facility DOCC report (ICF Kaiser, 1992) stated that several drums containing waste oils were present in the contained area on wooden pallets, and oil staining was present outside of the diked area on the ground surface. The stained area was approximately 45 feet by 30 feet. Absorbent pads were used to collect oil from any freestanding liquid on the ground surface. Drummed oil was sent off-site for recycling.

SWMU 3-1 was investigated during Phases 2 and 3 of the RFI.

Three borings (03-TB-01, 03-TB-02, and 03-TB-03) were advanced into the subsurface at SWMU 3-1 using a HSA drill rig and continuous split-spoon sampling. Test borings 03-TB-01 and 03-TB-02 were advanced to approximately 5 to 6 ft-bgs, and 03-TB-03 was advanced to 19 ft-bgs. Surface (0 to 2 ft-bgs) and shallow subsurface (3 to 5 ft-bgs) soil samples were collected from borings 03-TB-01 and 03-TB-02 for analysis by RECRA. At 03-TB-03 intervals from 1 to 3 ft-bgs, 3 to 5 ft-bgs, and 17 to 19 ft-bgs were submitted to RECRA for analysis. Samples submitted to RECRA were analyzed for lead, TCL VOCs, TCL SVOCs, TCL PCBs, TOX, and TPH.

Phase 3

Eight surface soil samples were collected during Phase 3 of the RFI and were analyzed by Quanterra for TCL PCBs. These soil samples were collected to further define the extent of PCBs detected in the Phase 2 sample results for SWMU 3-1.

The maximum detected concentration of TPH exceeds the screening value of 1,000 mg/kg for industrial soil in one sample plus its duplicate. The maximum concentration of two organics (Aroclor 1254 and benzo(a)pyrene) exceed the RBC for residential soil only.

Two VOCs (methylene chloride and trichloroethene) have maximum detected concentrations exceeding the default USEPA SSLs.

Trichloroethene concentrations slightly exceed the USEPA SSL in six samples collected at this SWMU. Concentrations of this constituent slightly exceed the USEPA SSL in surface samples at 02-TB-01 and 02-TB-02. Subsurface samples collected at 3 to 5 ft-bgs in 02-TB-02, and 3 to 5 ft-bgs and 17 to 19 ft-bgs in 03-TB-03 also contain trichloroethane at concentrations that exceed the default SSL.

The concentration of TPH exceeds the 1,000 mg/kg soil screening value in two samples, but the specific constituents of concern typically associated with TPH are below the industrial RBC. The concentration of the PCB Aroclor 1254, exceeds the Region III residential RBC in the surface (0 to 2 ft-bgs) and 3 to 5 ft-bgs samples at 03-TB-01. However, None of the sample results exceed the industrial RBC for PCBs. The maximum concentration of benzo(a)pyrene exceeds the residential RBC, but in only one sample. It is not present at levels greater than the industrial RBC.

SSLs were derived for SWMU 3-1 using site-specific data to further evaluate if the constituents detected at concentrations exceeding the USEPA SSLs could potentially migrate to groundwater at levels of concern. Site-specific SSLs were calculated for methylene chloride and trichloroethene, the VOCs with maximum concentrations that exceed the USEPA SSLs. The maximum detected concentrations of methylene chloride and trichloroethene did not exceed the site-specific SSLs.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. In addition, comparison to industrial soil criteria shows there is no concern related to the soil contact pathways. Although TPH concentrations exceed the screening values, the specific constituents which are associated with TPH (e.g. BTEX and PAHs) were not detected at concentrations above the industrial soil RBCs.

Based on this evaluation SWMU 3-1 is recommended for no further action.

SWMU 3-2: VEHICLE REPAIR FACILITY

The vehicle repair area was in operation from 1956 until the summer of 1995. It consisted of a maintenance building and outside storage areas. Wastes generated by this unit included soiled rags, old mechanical parts, small quantities of waste oil, and cleaning solvents. Wastes were stored in small contained waste storage units for off-site disposal. Waste oil was stored in an above ground steel tank with dimensions of 3 feet in diameter by 6 feet in length. This tank was located within a roofed concrete containment facility that was open on two sides and surrounded by a two-foot high concrete dike. Used ethylene glycol (antifreeze) was stored in a 3-foot by 3-foot container, which was located outdoors adjacent to the maintenance building.

After discontinuing use of the Vehicle Repair Facility in 1995, PPG leased the maintenance building to a vendor consortium. The vendor consortium is currently using the maintenance building for the storage of valves, piping, bearings, and other hardware they sell to the PPG Natrium facility. The tanks formerly used to store waste oil and used antifreeze were removed

on November 5, 1995. Other than the storage of hardware in the maintenance building, there are no ongoing activities, including waste storage, at this SWMU. Investigation work was conducted at

SWMU 3-2 by PPG on a voluntary, accelerated schedule in September, 1995. Following the investigation findings, PPG implemented an interim action in October 1995 to remove soil visibly stained with TPH, and/or exhibiting elevated Organic Vapor Meter (OVM) readings. Two areas were identified with visibly identifiable oil staining. Approximately 13 cubic yards of soil was removed from an area located approximately 10 feet northwest of the maintenance building. The dimensions of this excavation were approximately 10 ft by 12 ft by 3 feet deep. The second area was located adjacent to the southeast corner of the maintenance building. Approximately 2 cubic yards of visibly stained surface soil was removed from this area.

After removal of all visibly affected soil, confirmatory soil samples were collected from the base and side wall of the excavation. Samples N03-SE007-0102, N03-SE007-0203, and N03-SE008-0203 were analyzed for TPH, TOX, TCL VOCs, TCL SVOCs, and lead.

There were no constituents with maximum detected concentrations exceeding the Region III RBCs for either industrial or residential soil. Only one organic constituent (methylene chloride) had a maximum detected concentration that exceeds the default USEPA SSL. There were 14 organic constituents with maximum detection limits that exceeded the RBCs for residential soil and 28 that exceeded the default USEPA SSL. However, the detection limits are not considered elevated and within those normally achievable by the analytical methods.

Methylene chloride is a common laboratory contaminant and was detected in the blank associated with the soil samples at this SWMU. To further evaluate this SWMU for potential leaching of methylene chloride to groundwater, a site-specific SSL was developed. The maximum detected concentration of this constituent did not exceed the site-specific SSL.

Based on this evaluation SWMU 3-2 is recommended for no further action.

SWMU 3-3: STORM SEWERS, TRENCHES, AND DRAINS (AMMONIA PROCESS AREA)

This storm sewer system was constructed in the Ammonia plant area in 1955. The storm sewer piping is approximately 10 ft-bgs and consists of varying diameters of salt glazed vitrified clay pipe. Storm water runoff collects in this unit and discharges directly to the Ohio River via NPDES Outfall 002. When the Ammonia plant was in operation, non-contact cooling water and condensate water were also collected in this system. Condensate water entering this system passed through an oil/water separator to remove waste oils prior to discharge to the Ohio River.

During Phase 2 of the RFI, six Geoprobe™ test borings (03-GP-01 through 03-GP-06) were advanced into the subsurface at SWMU 3-3. The borings were advanced to depths varying between 12 and 19 ft-bgs. The total depth of each boring was targeted at 2 feet below the base of the sewer/trench/drain being investigated.

Eighteen soil samples plus one duplicate were collected from the six borings for submittal to RECRA for laboratory analysis. Samples were collected at 0 to 2 ft-bgs, 3 to 5 ft-bgs, and at the 2-foot interval below the base of the sewer. Samples from this SWMU were analyzed for BTEX, ammonia, pH, TCL PCBs, TOC, TOX, TPH, and lead.

One organic constituent (Aroclor 1254) was detected at a concentration slightly above the Region III RBC for residential soil in three of 18 soil samples collected at SWMU 3-3. The concentration of Aroclor 1254 does not exceed the Region III industrial RBC. TPH was detected in one sample at a concentration that slightly exceeds the 1,000 mg/kg screening criteria. However, the concentrations of

specific constituents of concern associated with the TPH (i.e. BTEX), are below the RBCs for both industrial and residential soil.

The detection limits for all of the PCB Aroclors slightly exceed the residential RBCs, but the detection limits are within those normally achievable by the analytical method and are not considered elevated. The detection limits for alpha-BHC and benzene slightly exceed the default USEPA SSL. However, alpha-BHC and benzene were not detected in any soil samples from this SWMU and the detection limits for these constituents are not elevated.

Comparison of soil analytical data to USEPA SSLs shows that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. Also, comparison of constituent concentrations to USEPA Region III RBCs for industrial soil shows there is no concern related to the soil contact pathways. The PCB Aroclor 1254 is present in a few surface samples at concentrations that slightly exceed the Region III residential RBC; however, it is not believed to be associated with SWMU 3-3 and is further evaluated in conjunction with SWMU 3-1 (Oil Water Separator Area).

Based on this evaluation SWMU 3-3 is recommended for no further action.

SWMU 4-1: BOTTOM/FLY ASH LANDFILL UNITS J-1 AND J-2

Two landfill units J-1 and J-2 accepted bottom and fly ash from the facility power plant until 1975. This SWMU occupies an area of approximately 10 acres. Other waste disposed in this area includes approximately 48,700 tons of barium waste, and wastes generated during the operation of the Marshall Plant prior to PPG's ownership of this area. The barium waste was dredged from the Inorganics Waste Pond and hauled to Cells J-1 and J-2 for disposal. The waste consisted of BaCO_3 , BaSO_4 , Fe_2O_3 and SiO_2 . During the Verification Investigation (VI; IT, 1992), barium was detected in groundwater wells adjacent to this SWMU at concentrations exceeding the 0.2 mg/l permit trigger. The amount and nature of Marshall Plant wastes sent to this area are unknown. This area is located within the 100 year floodplain of the Ohio River.

In May and June of 1993, PPG implemented a waste characterization investigation of SWMU 4-1 on a voluntary, accelerated schedule.

The primary compound of interest was barium, which had previously been detected in monitoring wells adjacent to the landfill during the VI (IT, 1992). The details of the investigation are provided in a draft report that was previously submitted to USEPA entitled "Waste Characterization Bottom/Fly Ash Landfill Cells J-1 and J-2" (ICF Kaiser, 1993b).

During the soil investigation portion of the waste characterization, twenty test borings were advanced using a HSA drill rig and continuous split-spoon sampling into the landfill, through the base, and into underlying soil. The boring logs (Appendix F) show landfill materials present at depths ranging between 3.5 ft-bgs and 12 ft-bgs.

Split-spoon samples taken within the landfill waste material at each 5-foot depth interval were submitted to the analytical laboratory for compositing and analysis of inorganic parameters and TCLP metals. Three grab (non-composited) samples were also analyzed for inorganics. In addition, nine grab samples were collected and submitted for VOC analysis where field screening indicated organic vapors above background levels. Several inorganics including barium and beryllium and VOCs including tetrachloroethene and trichloroethene were detected.

Groundwater samples were collected from temporary piezometers and four monitoring wells adjacent to the landfill (MW-112, MW-113, MW-114, and MW-116). A surface water sample was also collected from the Ohio River, adjacent to the landfill. The groundwater and surface water samples were analyzed for barium. The sampling results show the concentration of barium (dissolved or total) in all groundwater samples is above PPG's permit trigger of 0.2 mg/L (USEPA Permit for Corrective Action and Waste Minimization, issued to PPG, September 30, 1987), but below the USEPA MCL of 2 mg/L for this parameter. Barium was not detected in the sample collected from the Ohio River.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG at SWMU 4-1 in the fall of 1994 (ICF Kaiser, 1995b and 1996d). The soil gas survey found that soil in and adjacent to this unit may contain VOCs. The primary analytes detected in soil gas at this SWMU are the chlorinated organics tetrachloroethene, trichloroethene, 1,2-dichloroethene and vinyl chloride, all compounds associated with the former U.S. Chemical Corps Marshall Plant operations. Concentrations of VOCs increased with depth from the 2.5 ft-bgs to 10 ft-bgs samples, and then decreased in soil gas samples collected at 20 ft-bgs. This vertical distribution suggests that the VOCs observed in soil gas are attributable to a source in the vadose zone, instead of the result of volatilization from groundwater (i.e. continual increase with depth toward groundwater would be expected if groundwater were the source). These results are consistent with the soil analytical results reported for this SWMU in the Waste Characterization report (ICF Kaiser, 1993b).

An electromagnetic survey (RFI Phase 1, Task 1) was conducted at SWMU 4-1 in the fall of 1995 (ICF Kaiser, 1996d). Both quadrature and in-phase measurements were made on a 20-foot grid spacing over SWMU 4-1. The terrain (quadrature phase) and in-phase conductivity maps for this SWMU measured relative high and low conductivities within the landfill that are interpreted to represent variations in the thickness of buried ash material.

The scope of work for Phase 2 was defined based on the findings of the previous investigation work. Twelve test borings were installed, including eight borings (04-TB-01 through 04-TB-08) completed for the purposes of collecting samples for laboratory analysis and four borings (04-TB-C1 through 04-TB-C4) completed to confirm the limits of the landfill.

Borings 04-TB-01 through 04-TB-08 were drilled to groundwater, with depths ranging between 14 and 26 ft-bgs, to characterize the nature and thickness of materials contained in the landfill. Samples were collected from each boring at the surface (0 to 2 ft-bgs), shallow subsurface (3 to 5 ft-bgs), and the 2-foot interval above groundwater. Also, one additional sample was collected from 04-TB-06 from the 20 to 22 ft-bgs interval where field screening with the OVM indicated the presence of organic vapors at a concentration of 700 ppm. The samples were submitted to RECRA for analysis of TCL VOCs, TCL SVOCs, pH, and boron. The confirmatory borings (04-TB-C1 through 04-TB-C4) were drilled to depths ranging between 6 and 20 ft-bgs. Samples from the confirmatory borings were visually logged and field screened.

The maximum detected concentration of two organic (1,4-dichlorobenzene and tetrachloroethene) and two inorganic (arsenic and beryllium) constituents exceed the Region III RBCs for both industrial and residential soil. Six organics and four inorganics have maximum detected concentrations that exceed the residential RBCs. Fifteen organic constituents have maximum detected concentrations exceeding the default USEPA SSLs.

Concentrations of 1,4-dichlorobenzene exceed the industrial RBC in one sample, collected from 04-TB-06 (22 to 24-ft-bgs). Tetrachloroethene levels exceed the industrial RBC at PN-B17-S (11 to 13 ft-bgs), PN-B18-S (7 to 9 ft-bgs), 04-TB-05 (22 to 28 ft-bgs), 04-TB-06 (20 to 22 ft-bgs and 22 to 24 ft-bgs). The highest concentrations of 1,4-dichlorobenzene and tetrachloroethene correspond with visual observations

of the dark liquid and elevated OVM readings. This also corresponds to a location where the soil gas survey indicated elevated concentrations of chlorinated VOCs. Arsenic and beryllium are the only two inorganics with concentrations exceeding the industrial soil RBC.

Twenty-two (22) organics have maximum detection limits that exceed the Region III RBCs for both industrial and residential soil, while 17 organics have maximum detected concentrations exceeding RBCs for residential soil only. Fifty-nine (59) constituents have maximum detection limits which exceed the default SSLs. Although the maximum detection limits for many of these constituents are elevated beyond desirable limits, there are numerous samples with reasonable detection limits. The elevated detection limits are associated with samples where similar constituents were detected and a dilution required to quantify the detects.

Site-specific SSLs were derived for SWMU 4-1 to further evaluate if the organic and inorganic parameters exceeding the USEPA SSLs could potentially migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs. Six of the organic constituents revealed maximum detected concentrations exceeding the site-specific SSLs.

The data set for SWMU 4-1 was sorted to evaluate soils to which an industrial worker (0 to 2 ft-bgs) and a construction worker (0 to 5 ft-bgs) could be exposed. These data sets were compared to the Region III RBCs for industrial soil. The results of these comparisons show that no constituents exceed the industrial RBCs in the 0 to 2 ft-bgs interval or the 0 to 5 ft-bgs interval.

Although the analytical results for SWMU 4-1 show concentrations of constituents that exceed USEPA industrial RBCs, the constituent concentrations exceeding the industrial RBCs were from samples collected at depths for which direct soil contact will not occur. Analysis of shallow soil samples (down to 5 feet) shows no detected constituents with concentrations greater than Region III industrial RBCs.

Land use at the PPG Natrium facility is industrial and it's reasonable to anticipate it will remain industrial for the foreseeable future. However, maps depicting where constituent concentrations exceed the residential RBCs have been developed. The site-specific SSL calculation indicates there are several organic constituents present at this SWMU that could potentially migrate from soil to groundwater at levels exceeding conservative risk-based criteria. Field observations of a dark liquid at the water table interface in 04-TB-06 support the soil-to-groundwater migration assessment results and indicates that groundwater in this area contains organic constituents from this SWMU. However, the groundwater at the Natrium site in the sand and gravel aquifer is contained through on-site pumping. Locally at this SWMU, there may be a small component of groundwater flow in the silty clay alluvial deposits very near to and toward the river. However, the flow that may be toward the river is diminutive. In addition, on-site drinking water is treated before use and tested frequently. As result, there are no complete exposure pathways for groundwater

Based on this information SWMU 4-1 is recommended for no further action.

SWMU 4-2: MARSHALL PLANT WASTE POND

This unit was used by PPG as a disposal site for waste streams generated at the chlor-alkali plant, chlorinated benzene plant, and titanium tetrachloride plant between 1954 and 1979. The unit is approximately 275 feet by 220 feet and had a capacity of 18,000 cubic yards. Construction included clay walls and bottom. The unit was originally built by the U.S. government in the mid 1940's, and was operated for the U.S. Army Chemical Corps, first by DuPont, and then later by Glyco. Information relating to the quantity and nature of waste disposed during that time is not available. The pond was

closed in 1980 with the installation of a 6- to 8-inch soil cover. The surface is currently vegetated with grass. PPG managed wastes at the SWMU include iron chloride (FeCl), chlorinated benzenes, tar, iron, manganese, magnesium, zinc, cadmium, copper, vanadium, chromium, trafilier waste from chlorine products (K073), halogenated aliphatics, carbon tetrachloride (CCl₄), distillates from benzene chlorination (K085), various heavy organics and inorganic salts. The VI (IT, 1992) reported the detection of chlorinated organics and various inorganics (cadmium, chromium, and arsenic) in groundwater samples collected from monitoring wells near this SWMU.

The RFI scope of work performed at SWMU 4-2 consisted of soil gas and EM surveys performed during Phase 1 and a soil sampling program performed during Phase 2.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG at SWMU 4-2 in the fall of 1994 (ICF Kaiser, 1995b and 1996d). Seventeen soil gas samples were collected in and around SWMU 4-2.

The soil gas survey results for shallow samples (2.5 ft-bgs) at SWMU 4-2 indicate shallow soils do not contain VOCs at potential levels of concern. Samples collected at 10 ft-bgs show chlorinated VOCs (tetrachloroethene, vinyl chloride, and chloroform) may be present at potential levels of concern in soil at depth. The VOCs detected are typical Marshall Plant constituents. In a soil gas sample collected closer to groundwater (20 ft-bgs), total VOC concentrations diminish to trace levels, indicating that the vadose zone is the likely source of the VOCs observed in soil gas rather than volatilization from groundwater. The highest concentration of VOCs were found between SWMU 4-1 and SWMU 4-2 in the sample collected at 10 ft-bgs.

An electromagnetic survey (RFI Phase 1, Task 1) was conducted at SWMU 4-2 in the fall of 1995 (ICF Kaiser, 1996d). Both quadrature and in-phase measurements were made on a 20-foot grid spacing over SWMU 4-2.

Eight test borings were completed at SWMU 4-2 using a HSA drill rig and split spoon sampling. The borings were drilled to depths ranging between 10 and 34 ft-bgs to characterize the nature and thickness of disposed materials. Four of the eight borings (04-TB-09 through 04-TB-12) were installed to collect soil samples in and around SWMU 4-2 for analysis of TCL VOCs, TCL SVOCs, TCL PCBs/pesticides, and TAL inorganics. Four test borings (04-TB-13 through 04-TB-16) were drilled to provide information on the limits of SWMU 4-2 and to collect samples for geotechnical and general parameters potentially needed to support a corrective measures study.

Thirteen samples were collected for laboratory analysis from 04-TB-09 through 04-TB-12. Three samples were collected from each boring at the surface (0 to 2 ft-bgs), 3 to 5 ft-bgs, and the 2-foot interval above groundwater. One sample was collected from 04-TB-09 at a depth of 26 to 28 ft-bgs. This additional sample was collected at the interval exhibiting the highest OVM reading of 160 ppm.

Shelby tube samples for geotechnical analysis were collected from confirmatory borings 04-TB-13 and 04-TB-14 in the 0 to 2 ft-bgs, 3 to 5 ft-bgs, and 13 to 15 ft-bgs intervals. The Shelby tube samples from 04-TB-13 were transferred to sample containers and submitted for analysis of CEC, pH, TOC, TOX, and TPH. The Shelby tube samples from 04-TB-14 were submitted for analysis of grain size distribution, hydrometer, bulk density, permeability, moisture content, specific gravity, consolidation, and Atterberg limits.

Total petroleum hydrocarbon concentrations exceed the screening criteria of 1,000 mg/kg for soils. Two metals (arsenic and beryllium) were detected at concentrations exceeding the Region III RBCs for both industrial and residential soils. In addition, two metals (iron and vanadium), four organics (tetrachloroethene, 1,4-dichlorobenzene, benzo(a)pyrene and hexachlorobenzene) and one pesticide

(heptachlor epoxide) have maximum detected concentrations that exceed the RBCs for residential soil only.

Fourteen organic and four inorganic constituents have maximum detected concentrations exceeding the default USEPA SSLs.

The detected organics include chlorinated VOCs, SVOCs, and pesticides. Detections of the organic compounds are distributed throughout the sampled depths (i.e. surface, 3 to 5 ft-bgs, and deeper). The highest concentrations of VOCs, SVOCs, and pesticides are in samples collected near the top of groundwater. The organics are found both within and outside the SWMU boundary.

Arsenic is present at concentrations that exceed the industrial soil RBC in all of the samples analyzed. Beryllium exceeds the industrial soil RBC in three of 13 samples. The beryllium detections are in the surface and 3 to 5-ft-bgs samples at N04-TB-09 and the surface sample at 04-TB-10, both of which are located within the Marshall Pond limits.

Nine organics have maximum detection limits which exceed the Region III RBCs for both industrial and residential soils, while eight PCBs/pesticides and two organics have maximum detection limits which exceed the RBCs for residential soil only. In addition, 32 constituents have maximum detection limits which exceed the default USEPA SSLs. Although the maximum detection limits for many of these constituents are elevated above desirable limits, there are numerous samples with reasonable detection limits. The elevated detection limits are associated with samples where similar constituents were detected and a dilution performed to quantify the detects.

SSLs were derived for SWMU 4-2 using site-specific data to further evaluate if the constituents detected at concentrations exceeding the USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs.

Results of this comparison revealed that the maximum detected concentrations of tetrachloroethene and hexachloroethane exceed the site-specific SSLs.

The data set for SWMU 4-2 was sorted to evaluate soils to which an industrial worker (0 to 2 ft-bgs) and a construction worker (0 to 5 ft-bgs) could be exposed. These data sets were compared to the Region III RBCs for industrial soil. The results of these comparisons show only arsenic and beryllium exceeding the industrial RBC in the 0-2 ft-bgs interval, and these two constituents plus TPH in the 0 to 5 ft-bgs interval.

Beryllium was detected at levels above background at only one sample location (N04-TB-09). In all of the other sampling locations, beryllium was present at background levels. Arsenic was detected in the highest concentration at sampling location N04-TB-09. It was also detected at levels which exceed the Region III Industrial RBC in the three other sampling locations. In addition, although TPH was detected at a concentration exceeding the screening criteria, concentrations of associated constituents (e.g., BTEX and PAHs) were below the Region III RBCs. For these reasons, the potential for exposure to industrial or construction workers on a regular basis is extremely unlikely and would not pose an unacceptable risk to site workers.

The analytical results for SWMU 4-2 show concentrations of constituents that exceed the USEPA industrial RBCs. However, most of the concentrations exceeding the industrial RBCs occur at depth or in a SWMU where direct soil contact will not occur. PPG's training of employees on the potential chemical hazards of fly ash is an institutional control that mitigates concerns related to soil contact in an industrial

setting. Therefore, it is highly unlikely for an industrial or construction worker to come in contact with contaminated soils.

Land use at the PPG facility is industrial and it's reasonable to anticipate it will remain industrial for the foreseeable future. However, maps depicting where constituent concentrations exceed the residential RBCs have been developed.

The conservative site-specific SSL calculation indicates that there are two organic constituents present at this SWMU that could potentially migrate from soil to groundwater at levels exceeding conservative risk-based criteria. However, historical construction activities at the SWMU show that a clay liner was used to contain materials placed in the pond. This clay material is of a low permeability and should limit movement of any contaminants out of the SWMU. In addition, the mean concentrations of all constituents are less than the site-specific SSLs. In a localized area of this SWMU, there may be a small localized component of groundwater flow in the silty clay alluvial deposits toward the river. However, the flow that may be toward the river is diminutive and most of the flow is predominantly inland toward the pumping wells, or vertically downward into the hydrologically contained sand and gravel unit. In addition, on-site groundwater is treated before use and tested frequently.

Based on this information SWMU 4-2 is recommended for no further action.

SWMU 5-2: USED OIL STORAGE TANK

This 15,000-gallon above ground metal storage tank was used to store lubricating oil and was removed from the site in 1992. Available records do not indicate when this unit was put into operation. The tank was contained within an earthen dike which was also removed. Two concrete block retaining walls remain, and the area is covered with gravel.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG at SWMU 5-2 in the fall of 1994 (ICF Kaiser 1995b and 1996d). The soil gas survey results for SWMU 5-2 show that neither shallow (2.5 ft-bgs) nor deep (10 ft-bgs) soils are impacted by VOCs at levels of concern.

None of the constituents identified in soil samples collected at SWMU 5-2 had maximum detected concentrations or maximum detection limits exceeding either the USEPA SSLs or the Region III RBCs for industrial or residential soil.

Based all this information SWMU 5-2 is recommended for no further action.

SWMU 5-5: PROCESS AND SANITARY SEWERS FOR MARSHALL PLANT AREA

The exact installation date of this unit is not known; however, Marshall Plant operation began in 1943 or 1944. All sewers are constructed of vitrified clay pipe with varying diameters. Storm sewers discharge directly to internal Outfall 023, which in turn discharges to the Ohio River via NPDES Outfall 004. In the past, process sewers may have collected spills or wash waters containing sub-tropical bleach, amides, glycerines, glycols, amines, tetrachloroethene, tetrachloroethane or trichloroethane. These processes no longer exist in the Marshall Plant area.

During Phase 2 of the RFI, thirty-three soil samples were collected from eleven Geoprobe™ borings (05-GP-02 through 05-GP-12) at SWMU 5-5 adjacent to the underground sewers. The Geoprobe™ borings were advanced to a depth 2 feet below the base of the sewers to investigate for potential releases to the subsurface. Boring depths varied between 10 and 15 ft-bgs. Samples were collected from each boring at the surface (0 to 2 ft-bgs), 3 to 5 ft-bgs, and the bottom 2 feet of the boring. Field screening of the soil

samples with an OVM did not detect organic vapors in any of the eleven borings. Field observations did not reveal any evidence of contamination or odors. None of the borings encountered groundwater.

Two inorganic (arsenic and beryllium) and two organic constituents (benzo(a)pyrene and dibenz(a,h)anthracene) were detected in concentrations exceeding the Region III RBCs for both industrial and residential soils. Four additional constituents (iron, benzo(a)anthracene, benzo(b)fluoranthene, and indeno-(1,2,3-cd)pyrene) were detected at maximum concentrations that exceed the RBCs for residential soil only.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. In addition, the data evaluation shows there is no concern associated with direct soil contact at this SWMU.

Based on this information SWMU 5-5 is recommended for no further action.

SWMU 5-6: SANITARY LANDFILL

This unit is a Class III landfill that began operation in 1970 and was closed in 1990. It consists of three adjacent disposal sites constructed of a sandy clay loam soil with dimensions of 110 feet by 500 feet by 10 feet and has a 35,000 ton capacity. According to available information, this unit did not receive chemical waste. The landfill is currently covered and vegetated. Wastes managed in the landfill include paper, paper products, lumber, cement blocks, bricks, and various scrap metal.

A soil gas survey was conducted by PPG on a voluntary, accelerated schedule at SWMU 5-6 in the fall of 1994 (ICF Kaiser, 1995b and 1996d). Sixty five soil gas samples were collected from 39 locations in SWMU 5-6.

The soil gas survey results for samples collected at 2.5 and 10 ft-bgs at SWMU 5-6 indicated the presence of chlorinated and non-chlorinated VOCs in soil. VOCs of potential concern in shallow soil (2.5 ft-bgs) are confined to a small area in the southeastern landfill cell. The soil gas samples collected at 10 ft-bgs indicate a wider area of impact with VOCs as compared to the shallower samples. VOC concentrations in soil gas decrease with depth below the 10 ft-bgs interval (closer to groundwater). The detected chlorinated VOCs are indicative of the nearby former Marshall Plant. The soil gas survey results also revealed non-chlorinated VOCs including toluene, hydrocarbons, and light hydrocarbons.

Soil samples collected from SWMU5-6 revealed one organic (1,4-dichlorobenzene) and two inorganics (arsenic and mercury) that had maximum detected concentrations exceeding the Region III RBCs for both industrial and residential soil, while two inorganics (beryllium and iron) and one organic (benzo(a)pyrene) had maximum detected concentrations that exceed the RBCs for residential soil only.

Three organics (tetrachloroethene, 1,2-dichlorobenzene, and 1,4-dichlorobenzene), and three inorganics (chromium, mercury, and thallium) had maximum detected concentrations that exceed the default USEPA SSLs.

The data set for SWMU 5-6 was sorted to evaluate only soils to which an industrial worker could be exposed. Because this site is a landfill, no digging activities would occur here; therefore, a construction worker was not identified as an appropriate receptor. The soils in the 0 to 2 ft-bgs interval were compared to the Region III RBCs for industrial soil. The result of this comparison revealed only arsenic exceeding the industrial RBC in the 0 to 2 ft-bgs interval.

The mean detection of arsenic in the surface soils at this SWMU is within background levels. In addition, this SWMU is currently covered and vegetated. At present, no industrial activities occur within this SWMU. For these reasons, the potential for exposure to industrial workers is unlikely and would not pose unacceptable risk via the direct contact pathway.

Although the analytical results for SWMU 5-6 show concentrations of constituents that exceed USEPA industrial RBCs, most of the constituent concentrations exceeding the industrial RBCs are at depths at which direct soil contact will not occur. Analysis of surface soil samples shows only arsenic concentrations greater than Region III RBCs. The mean detection of arsenic is similar to background concentrations. Also, the area is vegetated and it is highly unlikely for an industrial worker to come in contact with contaminated soils. Based upon this evaluation, no further action is warranted at this SWMU for the direct contact pathway.

The conservative site-specific SSL calculation indicated that there are two organic constituents that could potentially migrate from the soil to groundwater at levels exceeding risk-based criteria. However, mean concentrations of these constituents are less than the site-specific SSLs. In addition, the groundwater beneath this SWMU is contained through on-site pumping. Therefore, no further action is warranted for SWMU 5-6.

AOC 3-1A: Acid Storage Tank

AOC 3-1A, consisting of a 30-foot long and 6-foot diameter, above-ground, steel storage tank, was previously used to store hydrochloric acid (HCl) for acidifying cooling water to reduce calcium buildup in piping. Observations made of this tank prior to its removal indicated it was in poor condition. The Description of Current Conditions Report DOCC (ICF Kaiser, 1992) reported soil beneath the tank was stained rust and black in color and there was no evidence that a containment structure existed. The tank formerly rested on concrete saddles and was elevated about 5 feet above the ground surface. No waste is reported to have ever been stored in the tank. Available records indicate this tank was installed in 1956 and removed in January of 1993.

PPG investigated AOC 3-1A in May 1994 on a voluntary accelerated schedule. The results of the investigation were provided to USEPA in a document entitled "Interim Action and Investigation Report For Selected RFI SWMUs and AOCs" (ICF Kaiser, 1996b) and a separate executive summary document (ICF Kaiser, 1996f.).

The investigation of AOC 3-1A consisted of the collection and analysis of one soil sample for pH and chloride. Although pH and chloride were within acceptable concentrations, approximately 1 foot of visibly stained soil was excavated and removed. Five confirmation soil samples were collected and analyzed for pH and chloride. The soil pH values were at a maximum of 6.2, which does not present a concern from a health perspective, because they are not low enough to be irritating. There are no screening criteria available for chloride, which is an essential nutrient in soil.

The parameters analyzed in soil at AOC 3-1A do not present a concern related to soil contact or migration to groundwater. Chloride is present, but does not pose risk because it is an innocuous constituent. Also, the observed pH values present no concerns related to the direct contact pathways. Even though constituents were not present at levels of concern PPG removed all soil exhibiting visual staining at this AOC.

Based on this information AOC 3-1 is recommended for no further action.

AOC 5-1A Soil located in the Marshall Plant Area

AOC 5-1A, soil located in the Marshall Plant Area, was potentially affected with hazardous waste during routine operations in the Marshall Plant. Potential constituents include tetrachloroethene, tetrachloroethane, trichloroethane, glycols, glycerines, amines, amides, and possibly several other compounds.

This AOC was investigated via a soil gas survey during Phase 1 and a soil sampling program during Phase 2 of the RFI.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary, accelerated schedule at AOC 5-1A in the fall of 1994 (ICF Kaiser, 1995b and 1996d). Numerous soil gas samples were collected within AOC 5-1A.

Soil gas results for samples collected at 2.5 and 10 ft-bgs indicated soil in AOC 5-1A contained VOCs. The VOCs of potential concern are chlorinated organics, including tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and vinyl chloride. These chlorinated organic compounds are all indicative of the former Marshall Plant operations.

Analytical results for soil samples collected at AOC 5-1A revealed two inorganic (arsenic and barium) and six organic constituents (alpha-BHC, beta-BHC, delta-BHC, 1,1,2,2-tetrachloroethane, methylene chloride and tetrachloroethene) at concentrations that exceeded the USEPA SSLs.

One inorganic constituent (arsenic) and one organic constituent (benzo(a)pyrene) were detected in concentrations that exceeded the Region III RBCs for both industrial and residential soil. Two inorganic constituents (beryllium and iron) and two organic constituents (benzo(a)anthracene and benzo (b) fluoranthene) exceeded the Region III RBCs for residential soils only.

SSLs were derived for AOC 5-1A using site-specific data to determine if the constituents detected at concentrations exceeding the USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeded the USEPA SSL. A comparison of constituents to SSLs revealed that there were no constituents with maximum detected concentrations exceeding the site-specific SSLs. The two constituents with concentrations exceeding the industrial RBCs (arsenic and benzo(a)pyrene) were evaluated with regard to their occurrence and concentration. Arsenic was detected in all of the samples collected in this AOC at concentrations exceeding the industrial RBC. However, the average arsenic concentration at AOC 5-1A is similar to average concentrations in samples collected from the background area. Therefore, the arsenic detected in AOC 5-1A is not considered elevated. In addition, the average detected value of benzo(a)pyrene is less than the industrial RBC, indicating that direct contact is not a pathway of concern.

Based on this information AOC 5-1A is recommended for no further action.

AOC 5-2A: ABOVEGROUND FUEL OIL STORAGE TANK AREA

This aboveground storage tank has a capacity of approximately 10,000 gallons and is supported by concrete foundations approximately 4 feet above ground surface. The tank is completely contained by a 3-foot high concrete dike with dimensions of approximately 40 feet by 15 feet.

A soil gas survey (RFI Phase 1, Task 2) was conducted at AOC 5-2A by PPG on a voluntarily accelerated schedule in the fall of 1994 (ICF Kaiser, 1995b and 1996d). Soil gas samples were collected at 2.5 and 10 ft-bgs adjacent to AOC 5-2A at the four locations. The soil gas survey found tetrachloroethene, which is not a component of fuel oil, adjacent to this AOC. The tetrachloroethene detection is likely associated with the Marshall Plant operations, and is not attributable to AOC 5-2A. Only trace amounts of benzene, a possible component of the fuel oil, was detected in one soil gas sample at 2.5 ft-bgs. VOCs associated with fuel oil were not detected in the 10 ft-bgs samples.

The analytical results of soil samples collected from AOC 5-2 revealed constituent concentrations that did not exceed the Region III RBCs for industrial or residential soil. Detection limits for two organic constituents (benzo(a)pyrene and dibenzo(a,h)anthracene) exceeded the Region III RBCs for residential soil. However, the detection limits for these constituents are reasonable and not considered to be unusually elevated. In addition, neither of these organics were detected in any of the samples collected in AOC 5-2A.

Based on this information AOC 5-2A is recommended for no further action.

AOC 5-3A: FORMER GASOLINE STORAGE FACILITY

These former gasoline storage tanks were removed in 1992. The capacity of the tanks is not known. The area where the tanks were situated is vegetated and stains were not present on the ground surface. These tanks were installed during the fuel shortage in World War II, however, it is not known whether these tanks were ever used.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary, accelerated schedule at AOC 5-3A in the fall of 1994. Soil gas samples were collected at 2.5 and 10 ft-bgs at AOC 5-3A at six locations.

Total VOCs were found at potential levels of concern at AOC 5-3A in both the 2.5 ft-bgs and 10 ft-bgs samples; however, the analytes detected are not constituents of gasoline. The constituents of potential interest in soil gas were chlorinated organics tetrachloroethene and vinyl chloride, both of which are indicative of the former Marshall Plant operation. The only potential constituent associated with gasoline detected at this AOC is toluene, at trace levels in a 2.5 ft-bgs sample. Gasoline constituents were not detected in deeper soil gas samples at this AOC.

Soil samples at this AOC were collected at locations biased toward areas where the soil gas survey indicated the highest potential for contamination. Soil samples submitted to the laboratory were analyzed for BTEX, TOX, TPH, and lead.

Analytical results revealed constituents were not present in AOC 5-3A soil samples at concentrations that exceed the default USEPA SSLs or residential or industrial screening criteria. Constituent detection limits did not exceed the screening criteria for either residential or industrial soil.

Based on this information AOC 5-3A is recommended for no further action.

SWMU 6-1: K085 ACCUMULATION AREA

This outdoor satellite area collects wastes from the production of chlorinated benzenes (K085) in-line during process operations. The entire area is concrete paved and a 3-inch dike contains each collection area. Previously, waste was collected in 55-gallon drums, which are supported on steel racks in an area approximately the size of two 55-gallon drums. Currently the K085 waste is collected in a 20-gallon fiber container and moved to the RCRA storage area within 3 days.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary, accelerated schedule at SWMU 6-1 in the fall of 1994 (ICF Kaiser, 1995b and 1996d). Soil gas samples were collected at 2.5 and 10 ft-bgs at SWMU 6-1 at one location. The analytical results for soil gas samples collected at 2.5 ft-bgs and 10 ft-bgs at SWMU 6-1 indicate that neither shallow nor deep soil at this SWMU contain VOCs at levels of concern. Soil samples were collected for laboratory analysis beneath surficial gravel (1 to 3 ft-bgs), 3 to 5 ft-bgs, and 13 to 15 ft-bgs. The soil samples were analyzed for TCL VOCs, TCL SVOCs, and TCL PCBs/pesticides. The sample from 3 to 5 ft-bgs was also analyzed for TOC and CEC.

Analytical results of soil samples collected at SWMU 6-1 indicated eight organic constituents have maximum detected concentrations exceeding the USEPA default SSLs. Alpha-BHC was detected at a concentration exceeding the Region III RBCs for both industrial and residential soil. Three constituents (delta-BHC, gamma-BHC and 1,4-dichlorobenzene) were detected in concentrations exceeding the Region III RBCs for residential soil only.

1,1,2,2-Tetrachloroethane exceeds the USEPA SSL in the sample collected at 13 to 15 ft-bgs. SVOCs exceeding the USEPA SSL are limited to the 1 to 3 ft-bgs and 3 to 5 ft-bgs samples. Pesticides exceed the USEPA SSLs in samples collected at 1 to 3 ft-bgs, 3 to 5 ft-bgs and 13 to 15 ft-bgs. The pesticide alpha-BHC was detected at concentrations slightly above the Region III industrial RBC in samples collected from 1 to 3 ft-bgs and 13 to 15 ft-bgs. PCBs were not detected in any of the soil samples.

SSLs were derived for this SWMU using site-specific data to further evaluate if the constituents detected with concentrations exceeding the USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs. The results of this comparison revealed that the maximum detected concentration of alpha-BHC slightly exceeds the site-specific SSL.

The evaluation of alpha-BHC, detected slightly above the Region III industrial RBC, shows that direct contact exposure would not be a concern. The average concentration of alpha-BHC slightly exceeds the conservative site-specific SSL calculation indicating a minimal potential for migration from the soil to groundwater. Also, groundwater beneath this SWMU is contained on-site by pumping of production wells. As a result, no further action is warranted for SWMU 6-1.

SWMU 6-3: ORGANICS TREATMENT AREA

This six year old treatment system consists of a steam stripper and carbon adsorption column and is used to treat organic constituents in wastewaters collected in sewers and sumps throughout the MCB process area. The steam stripper is approximately 60 feet high and has a diameter of 5 feet. The carbon adsorption column is approximately 5 feet in diameter and approximately 8 feet high. It is a closed system that operates 24-hours per day. The area is completely paved with concrete.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary, accelerated schedule at SWMU 6-3 in the fall of 1994. Soil gas samples were collected at 2.5 and 10 ft-bgs at three locations around the perimeter of the concrete-lined containment system.

The only VOC detected in the 2.5 ft-bgs samples at levels of potential concern was acetone, which is suspected to be an analytical laboratory artifact. Chlorinated organics were also detected at trace levels.

One Geoprobe™ test boring, 06-GP-01, was advanced to 12 ft-bgs to investigate SWMU 6-3. Soil samples designated for laboratory analysis were collected from the surface (0 to 2 ft-bgs), 3 to 5 ft-bgs, and 8 to 12 ft-bgs. The samples were analyzed for TCL VOCs, TCL SVOCs, and TCL PCBs.

There were nine organic constituents with maximum detected concentrations exceeding the USEPA SSLs. None of the analytes were detected at concentrations that exceed the Region III RBCs for industrial soil.

SSLs were derived for SWMU 6-3 based on site-specific data to further evaluate if the organics detected at concentrations exceeding the USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each organic constituent that exceeded the USEPA SSL. Maximum detected concentrations of each organic were then compared to the site-specific SSLs. There were no constituents with maximum detected concentrations exceeding the site-specific SSLs.

Comparison of the soil analytical data to the SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. Also, based on a comparison of the analytical data to Region III RBCs for industrial soil, there is no concern related to the soil contact pathways. As a result, no further action is warranted for this SWMU.

SWMU 6-4: MCB PROCESS SEWERS

This sewer system was originally installed in 1947 with the construction of the MCB facility. All wastewater handled via the MCB process sewers was discharged directly to the Ohio River until the system was upgraded in 1989/90.

The current MCB process sewer system collects pad containment, cooling water, and process wastewaters from the MCB production area. These wastewaters are then treated in the organics treatment system consisting of a steam stripping column, tail gas scrubber and carbon adsorption system. After treatment, wastewater flows to the pH collection system for pH adjustment. The water is then discharged to the Ohio River via NPDES Outfall 009. All discharges are monitored for organics prior to discharge to the pH collection system.

SWMU 6-4 was investigated during Phase 2 of the RFI. Twenty-nine borings were drilled at SWMU 6-4. Twenty-four of the borings (06-GP-02 to 06-GP-25) were completed within the MCB production area and five (06-GP-26 to 06-GP-30) were completed along the common sewer. The borings were advanced to depths varying between 8 and 20 ft-bgs, depending upon the depth of the sewer system. Samples for laboratory analysis were collected at the surface (0 to 2 ft-bgs), 3 to 5 ft-bgs, and the 2-foot interval at the bottom of the boring. An additional sample was also collected from each boring from the interval that exhibited the highest OVM reading. Ninety-one soil samples (inclusive of the duplicates) from this SWMU were analyzed for TCL VOCs, TCL SVOCs, and TCL PCBs/pesticides.

Twenty-three organic constituents had maximum detected concentrations exceeding the USEPA default SSLs. Nine organic constituents were detected at concentrations exceeding the Region III RBCs for both

industrial and residential soil, while four organics had maximum detected concentrations which exceed the RBCs for residential soil only.

SSLs were derived for SWMU 6-4 using site-specific data to evaluate whether the constituents detected at concentrations exceeding the USEPA default SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeded USEPA SSLs. Maximum detected concentrations were then compared to the site-specific SSLs. Six organic constituents (alpha-BHC, beta-BHC, gamma-BHC, 1,1,2,2-tetrachloroethane, 1,4-dichlorobenzene, and n-nitroso-di-n-propylamine) have maximum detected concentrations exceeding the site-specific SSLs.

The data set for SWMU 6-4 was sorted to evaluate soils to which an industrial worker (0 to 2 feet) and a construction worker (0 to 5 feet) could be exposed. These data sets were compared to the Region III RBCs for industrial soil. The results of these comparisons show that eight constituents exceed the Region III RBCs for industrial soil: Aroclor 1260, aldrin, dieldrin, heptachlor, alpha-, beta-, and gamma-BHC, and 1,4-dichlorobenzene. These constituents were identified as COIs for SWMU 6-4. Therefore, site-specific risk assessments were performed for both the industrial worker and construction worker scenarios.

The site-specific risk assessment results for SWMU 6-4 are within the acceptable targets (hazard index of one or less, and risks within the range of 10^{-6} and 10^{-4}) according to the USEPA (1989a). Therefore, no further action is warranted for SWMU 6-4 for direct contact pathway. In addition, although concentrations of some constituents exceed site-specific SSLs, groundwater beneath this SWMU is contained through on-site pumping. As a result, no further action for the leaching to groundwater pathway is warranted.

SWMU 6-5: MCB PRODUCT TANK CAR LOADING AREA

The railcar loading area was installed in 1948 and occupies approximately 8,000 feet². Mono-, tri-, and para-benzene products are loaded here at seven locations. Spills are collected by a fiberglass catch-all tray covering a concrete containment sump, which is connected to the organics treatment system.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary, accelerated schedule at SWMU 6-5 in the fall of 1994 (ICF Kaiser 1995b and 1996d). Soil gas samples were collected from 8 locations along the railroad tracks and in the MCB loading area.

The soil gas results for samples collected at 2.5 and 10 ft-bgs indicate that neither shallow or deep samples at SWMU 6-5 contain VOCs at levels of concern. The detected VOCs were trace levels of primarily chlorinated organics. One Geoprobe™ boring (06-GP-31) was installed at SWMU 6-5 to a depth of 15 ft-bgs, at the location where the soil gas survey indicated the highest concentration of VOCs (Figure 6.19-1). Soil samples were collected at surface (0 to 2 ft-bgs), 3 to 5 ft-bgs, and 13 to 15 ft-bgs. The samples were analyzed for TCL VOCs and TCL SVOCs.

There were three SVOCs (1,2,4-trichlorobenzene, 1,4-dichlorobenzene, and 4-chloroaniline) with maximum concentrations exceeding the USEPA SSLs. There were no constituents detected at concentrations exceeding either industrial or residential RBCs. The organics with concentrations exceeding the USEPA SSLs are SVOCs. At least one of these constituents exceeds the USEPA SSL in each sampling depth interval. Therefore, SWMU 6-5 was evaluated further using site-specific SSLs.

SSLs were derived for SWMU 6-5 using site-specific data to further evaluate if the SVOCs detected at concentrations exceeding the USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL.

Maximum detected concentrations of constituents were then compared to the site-specific SSLs. There were no constituents with maximum detected concentrations exceeding the site-specific SSLs.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. Also, comparison of the analytical data to Region III industrial soil RBCs shows there is no concern related to the soil contact pathways. As a result, no further action is warranted for this SWMU.

SWMU 6-6: CLEANOUT AREA FOR PROCESS EQUIPMENT

There are two process equipment cleanout areas. The first area is located approximately 50 feet north of the storage tanks in the MCB area. The area is covered with gravel. An above ground storage tank, which stored used oil, was removed in 1963. The area was previously used to clean MCB process equipment. Currently, the area is used to store clean heat exchangers. The second area is approximately 30 feet north of the MCB process area. This area consists of a concrete pad (approximately 600 square feet) installed in 1991, and three concrete walls installed in 1992. The floor is sloped to drain wastewater to the organics treatment system. The ground around the semi-contained area is covered with gravel.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary accelerated schedule at SWMU 6-6 in the fall of 1994 (ICF Kaiser, 1995b and 1996d). Soil gas samples were collected from six locations at depths of 2.5 and 10 ft-bgs and from one location at a depth of 15 ft-bgs in or near the MCB process equipment cleanout area.

Trace levels of VOCs were detected in the soil gas samples collected from all depths in the cleanout area. No distinct source of VOCs was identified.

Two Geoprobe borings (06-GP-32 and 06-GP-33) were advanced into the subsurface at SWMU 6-6, one at each of the two cleanout areas. Boring 06-GP-32 was advanced to 20 ft-bgs and 06-GP-33 was advanced to 16 ft-bgs. Samples were collected from the surface (0 to 2 ft-bgs), shallow subsurface (3 to 5 ft-bgs), and deep subsurface (the bottom 4 feet of each boring). Seven samples (including a duplicate) were submitted to RECRA for analysis of TCL VOCs, TCL SVOCs, and TCL PCBs.

Eight Geoprobe™ borings (06-GP-45 through 06-GP-52) were completed in SWMU 6-6 during Phase 3 of the RFI. Forty two (42) samples were field screened for BHC by Kemron. Five samples were collected and analyzed by Quanterra for TCL pesticides. All sample results are shown on.

Four organic constituents (alpha-BHC, beta-BHC, gamma-BHC, and methylene chloride) revealed maximum detected concentrations that exceed the USEPA default SSLs. Three organic constituents (alpha-BHC, beta-BHC, and gamma-BHC) were detected at concentrations exceeding the Region III RBCs for both industrial and residential soil. Three organics (Aroclor 1260, aldrin, and hexachlorobenzene) had maximum detected concentrations that exceed the RBCs for residential soil only.

The only constituents detected at concentrations above industrial RBCs are the alpha-, beta-, and gamma-BHC isomers. Each of the detections exceeding the RBCs were from the same sample: 06-GP-45-0002. Twenty constituents had maximum detection limits that exceed the USEPA default SSLs. Five organic constituents had maximum detection limits that exceed the Region III RBCs for both industrial and residential soil, while ten organics had maximum detection limits that exceed the RBCs for residential soil only. However, the detection limits were within those normally achievable by the analytical methods and are not considered elevated.

SSLs were derived for SWMU 6-6 using site-specific data to evaluate whether the constituents detected at concentrations exceeding the USEPA default SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceed USEPA SSLs. Maximum detected concentrations were then compared to the site-specific SSLs.

Analytical results indicated that two organic constituents (alpha-BHC and beta-BHC) had maximum detected concentrations exceeding the site-specific SSLs.

The data for SWMU 6-6 were sorted to evaluate soils to which an industrial worker (0 to 2 ft-bgs) and a construction worker (0 to 5 ft-bgs) could potentially be exposed. These data were compared to the Region III RBCs for industrial soil. The results of these comparisons show that three constituents exceeded the Region III RBCs for industrial soil: alpha-, beta-, and gamma-BHC. These constituents were identified as COIs for SWMU 6-6. Therefore, site-specific risk assessments were performed for both the industrial worker and construction worker scenarios.

Due to the nature of this SWMU, contact by site workers does not occur on a daily basis. In addition, contact with soils is precluded by the presence of gravel and pavement over the majority of the SWMU. Therefore, the exposure frequency has been adjusted to 100 days/year (two days per week; 50 weeks per year, which is still quite conservative) for the industrial worker. The results of the site-specific risk assessment for SWMU 6-6 indicate that the hazard index and theoretical excess lifetime cancer risk for an industrial worker are 0.02 and 7×10^{-5} , respectively. The hazard index and theoretical excess lifetime cancer risk for a construction worker are 0.07 and 1×10^{-5} , respectively. These results are within the acceptable targets (hazard index of one or less, and risks within the range of 10^{-6} and 10^{-4}) according to the USEPA (1989a). Constituents are present in soil of this SWMU at concentrations that exceed the residential RBC, but the current and likely future land use for the Natrium site is industrial.

The results of the site-specific risk assessment for SWMU 6-6 indicate that the hazard index and theoretical excess lifetime cancer risk for an industrial worker are 0.02 and 7×10^{-5} , respectively. The hazard index and theoretical excess lifetime cancer risk for a construction worker are 0.07 and 1×10^{-5} , respectively. These results are within the acceptable targets (hazard index of one or less, and risks within the range of 10^{-6} and 10^{-4}) according to the USEPA (1989a). Therefore, no further action is warranted for SWMU 6-6 for the soil contact pathway. In addition, although some constituents exceed the conservative site-specific SSLs, groundwater beneath this SWMU is contained through on-site pumping. As a result, no further action for the groundwater leaching pathway is warranted. Based on the results of the soil contact pathways and leading to groundwater evaluations, this SWMU is recommended for no further action.

SWMU 6-7: FORMER LOCATION OF BHC PILE

The former benzene hexachloride (BHC) waste pile was located in an open area approximately 400 feet north of the MCB production area offices. The BHC waste material was stored directly on the ground in unknown quantities. The pile is no longer present and the removal date is not known. The pile existed during the operation of the BHC plant. This plant operated during the 1950's until 1961.

SWMU 6-7 was investigated during Phases 1, 2, and 3 of the RFI.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary accelerated schedule at SWMU 6-7 in the fall of 1994 (ICF Kaiser, 1995b and 1996d). Soil gas samples were collected from four locations at depths of 2.5 and 10 ft-bgs. Only trace levels of VOCs were detected in the soil gas samples collected from 2.5 ft-bgs and concentrations increased in the samples collected at 10 ft-bgs. The maximum concentration of total VOCs was detected on the south side of the location of the former pile.

One Geoprobe boring (06-GP-34) was advanced into the subsurface at SWMU 6-7. The boring was advanced to 25 ft-bgs and samples were collected from the surface (0 to 2 ft-bgs), 3 to 5 ft-bgs, at the interval with the highest OVM reading (19 to 21 ft-bgs), and 21 to 25 ft-bgs. Four samples (including a duplicate) were analyzed for metals, VOCs, SVOCs and PCBs. Four additional confirmatory Geoprobe borings (06-GP-41 through 06-GP-44) were drilled to depths ranging between 21 and 24 ft-bgs to define the lateral extent of the SWMU using both OVM field screening and visual observations.

The Phase 3 investigation of SWMU 6-7 consisted of 24 soil borings to a maximum depth of 21 ft-bgs. A total of 102 samples were collected and field screened for BHC. Seven soil samples were collected as split-samples and analyzed for pesticides to confirm the results of the BHC field screening results.

Three organic constituents (alpha-BHC, beta-BHC and gamma-BHC) and one inorganic constituent (arsenic) had maximum detected concentrations that exceed the USEPA default SSLs. Two organic constituents (alpha-BHC and beta-BHC) and one inorganic constituent (arsenic) were detected at concentrations exceeding the Region III RBCs for both industrial and residential soil. The maximum detected values of each of these constituents were from a surface (0 to 2 ft-bgs) sample. Each of the above constituents was not detected or was detected below the USEPA default SSL in the deepest sample at that location, indicating leaching to groundwater at levels of concern will not occur.

Twenty-five constituents had maximum detection limits that exceed the USEPA default SSLs. In addition, 15 organic constituents had maximum detection limits that exceed the Region III RBCs for both industrial and residential soil, while two organics have maximum detection limits that exceed the RBCs for residential soil only. Although the maximum detection limits for some pesticides were elevated above desirable limits, there are samples with reasonable detection limits. The elevated detection limits are associated with samples where similar constituents were detected and a dilution performed to quantify the detections.

SSLs were derived for SWMU 6-7 using site-specific data to further evaluate whether the constituents detected at concentrations exceeding the USEPA default SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeded USEPA SSLs. Maximum detected concentrations were then compared to the site-specific SSLs. Two organic constituents (alpha-BHC and beta-BHC) had maximum detected concentrations exceeding the site-specific SSLs. The SSL equation is conservative in that it assumes the source is directly above groundwater. The constituents of concern at this SWMU are not directly above groundwater at concentrations that exceed the site-specific SSL and there are deeper samples at the same locations with concentrations less than the site-specific-SSL. As a result, constituent levels of concern from soil to groundwater are not expected.

The data set for SWMU 6-7 was sorted to evaluate soils to which an industrial worker (0 to 2 ft-bgs) and a construction worker (0 to 5 ft-bgs) could potentially be exposed. These data sets were compared to the Region III RBCs for industrial soil. The results of these comparisons show that three constituents exceed the Region III RBCs for industrial soil: arsenic, alpha-BHC, and beta-BHC. These constituents were identified as COIs for SWMU 6-7. Therefore, site-specific risk assessments were performed for both the industrial worker and construction worker scenarios.

The results of the site-specific risk assessment for SWMU 6-7 indicate that the hazard index and theoretical excess lifetime cancer risk for an industrial worker are 0.05 and 7×10^{-5} respectively. The hazard index and theoretical excess lifetime cancer risk for a construction worker are 0.3 and 9×10^{-6} , respectively. These results are within the acceptable hazard index of one or less, and risks range of 10^{-6} and 10^{-4} . Constituents are present in soil at this SWMU at concentrations that exceed the residential RBC, but the current and anticipated land use for the Facility is industrial. Therefore, no further action is

warranted for SWMU 6-7 for the direct contact pathway. In addition, although some constituents exceeded the site-specific SSLs, groundwater beneath this SWMU is contained on-site through pumping of the facility production wells.

Based on the results of the soil contact pathways and leaching to groundwater evaluations, this SWMU is recommended for no further action.

AOC 6-1A: INTERMEDIATE AND PRODUCT STORAGE CONTAINMENT AND SUMP

AOC 6-1A consists of the MCB intermediate and product storage area containment system and associated sump. This AOC temporarily stores intermediate and product material generated in the MCB production area prior to its removal. The entire area (14,300 ft²) is contained by 6-foot concrete walls and is lined with 6 inches of clay. The area is subdivided into five contained areas by 6-foot concrete walls. There are 11 above ground storage tanks within the contained areas. Four tanks hold approximately 10,000 gallons, six hold approximately 15,000 gallons and one holds approximately 100,000 gallons. A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary accelerated schedule at AOC 6-1A in the fall of 1994 (ICF Kaiser 1995b and 1996d). Soil gas samples were collected at 2.5 ft-bgs and 10 ft-bgs from four locations on the southern and western perimeters of the concrete-walled containment system.

The soil gas results show trace levels of VOCs detected in the soil gas samples collected from all depths along the perimeter of the containment area. Tetrachloroethene is the only VOC detected in concentrations above trace levels.

One Geoprobe boring was advanced into the subsurface at AOC 6-1A along the eastern perimeter of the containment area. Boring 06-GP-35 was advanced to 20 ft-bgs. Samples were collected from the surface (0 to 2 ft-bgs), the shallow subsurface (3 to 5 ft-bgs), and the deep subsurface (the bottom 4 feet of the boring). The samples were submitted to RECRA for analysis of TCL VOCs, TCL SVOCs, and TCL PCBs.

Constituents detected in soil samples collected from AOC 6-1A were not present at concentrations that exceed the residential or industrial RBCs or the default USEPA SSLs. Although several constituent detection limits exceed the residential RBC or USEPA SSL, the detection limits are within those normally achievable by the analytical method and are not considered elevated.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this AOC. Also, comparison of constituent concentrations with USEPA Region III RBCs for industrial soil shows there is no concern related to the soil contact pathways. As a result, no further action is warranted for AOC 6-1A.

AOC 6-2A: SOIL BENEATH CARBON BISULFIDE TANK

The 5,000-gallon 44-foot diameter CS₂ tank is located in a fence enclosed tank farm along the Ohio River. All tanks in this area are contained within earthen dikes. This tank was installed in 1965.

AOC 6-2A was investigated via a soil gas survey during Phase 1 and a soil sampling program during Phase 2 of the RFI.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary accelerated schedule at AOC 6-2A in the fall of 1994 (ICF Kaiser, 1995b and 1996d). Soil gas samples were collected from one location to the southwest of the CS₂ tank at depths of 2.5 and 10 ft-bgs. Additional soil gas samples were

collected at 2.5 and 10 ft-bgs, approximately 125 feet southeast of the first sample, to assess the horizontal extent of VOCs.

Soil gas results for the 2.5 ft-bgs samples show shallow soils at this AOC do not contain VOCs at levels of concern. Chlorobenzene and carbon disulfide were detected at concentrations exceeding trace levels in 10 ft-bgs samples.

Two Geoprobe borings (06-GP-36 and 06-GP-37) were advanced into the subsurface at AOC 6-2A. Boring 06-GP-36 and 06-GP-37 were both advanced to 14 ft-bgs. Samples were collected from the surface (0 to 2 ft-bgs), 3 to 5 ft-bgs, the interval with the highest OVM reading, and the bottom 4 feet of each boring. Nine samples (including one duplicate) were submitted to RECRA for analysis of TCL VOCs.

Comparison of soil analytical data to the SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this AOC. Also, comparison of constituent concentrations to Region III RBCs for residential and industrial soil shows there is no concern related to the soil contact pathway. As a result, no further action is warranted for AOC 6-2A.

AOC 6-3A: SOIL THROUGHOUT MCB PRODUCTION AREA

AOC 6-3A includes soil throughout the MCB production area. This area includes approximately 40,000 feet² which is covered with asphalt and gravel. MCB process equipment was cleaned in a portion of the unpaved area prior to installation of the concrete pad in the clean-out area. Stormwater collected from this area discharges into the Ohio River via NPDES Outfall 009.

The AOC 6-3A investigation included a soil gas survey performed during Phase 1 and a soil sampling program performed during Phase 2 of the RFI.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary accelerated schedule at AOC 6-3A in the fall of 1994 (ICF Kaiser 1995b and 1996d). A total of seventeen soil gas samples were collected from nine locations northwest of the main MCB production area at depths of 2.5 ft-bgs (7 samples), 10 ft-bgs (8 samples), 20 ft-bgs (1 sample), and 30 ft-bgs (1 sample). In the samples in the northwest of this AOC, low levels of total VOCs were detected in the soil gas samples collected from 2.5 ft-bgs and concentrations generally increased in the samples from 10 ft-bgs. The samples collected at depth also show generally elevated levels of total VOCs. The maximum detected concentration of total VOCs is at 10 ft-bgs in an open area east of the railroad tracks, near the turn in the MCB area rope fence.

Low levels of total VOCs were detected in the soil gas samples collected in the southeast portion of the AOC from a depth of 2.5 ft-bgs. Concentrations generally increased in the samples collected from a depth of 10 ft-bgs. The maximum detected concentration of total VOCs is at 10 ft-bgs in an open area across from Skyline Drive, east of the chlorine office building.

The soil sampling program at AOC 6-3A consisted of three Geoprobe borings. Two Geoprobe borings were advanced to a depth of 12 ft-bgs and the third was advanced to 16 ft-bgs. Samples were collected from the surface (0 to 2 ft-bgs), shallow subsurface (3 to 5 ft-bgs), and the bottom 2 feet of the boring. In addition, one boring (06-TB-02) was advanced into the subsurface using a HSA drill rig and continuous split-spoon sampling. The HSA boring was advanced to 20 ft-bgs and samples were collected from the surface, shallow subsurface, and deep subsurface (18 to 20 ft-bgs). One additional sample was collected in the 6 to 8 ft-bgs interval in 06-TB-02 due to an elevated reading on the OVM field instrument. Thirteen samples were submitted to RECRA for analysis of TCL VOCs, TCL SVOCs, TCL PCBs, and pH.

Two Shelby tube samples were collected from 06-TB-02 in the 1 to 3 ft-bgs and 16 to 18 ft-bgs intervals. The samples were analyzed for the geotechnical parameters CEC, TOC, TOX, grain size distribution, hydrometer, bulk density, permeability, moisture content, BTU value, percent ash, and flash point.

Two VOCs (chlorobenzene and tetrachloroethene) revealed maximum detected concentrations exceeding the USEPA SSLs.

Only one constituent (hexachlorobenzene) was detected at a concentration exceeding the Region III RBC for residential soil. Constituents were not detected at concentrations exceeding the Region III RBCs for industrial soil.

SSLs were derived for this AOC using site-specific data to further evaluate if the VOCs detected at concentrations exceeding USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs.

Comparison of soil analytical data to SSLs indicated that there is no concern related to migration of detected constituents from soil to groundwater at this AOC. Also comparison of constituent concentrations to the Region III RBCs for industrial soil shows there is no concern related to the soil contact pathway. Therefore, No Further Action was recommended for this AOC.

SWMU 7-1: LABORATORY SEWER SYSTEM

This sewer system was installed in 1955. In the past, various constituents were discharged into this sewer, which in turn discharged to the Ohio River via NPDES Outfall 009. Construction materials include cast iron pipe.

SWMU 7-1 was investigated during Phase 2 of the RFI. This investigation consisted of seven Geoprobe borings. Each boring was advanced to a depth 2 feet below the sewer to investigate potential subsurface releases. Boring 07-GP-06, was the deepest boring and was advanced to 19 ft-bgs. Three samples were collected from each boring; surface (0 to 2 or 1 to 3 ft-bgs, depending on surface conditions), shallow subsurface (3 to 5 ft-bgs), and at depth (2 feet below the bottom of the sewer). Also, one additional sample from boring 07-GP-01 (9 to 12 ft-bgs) was collected where field screening indicated potentially elevated concentrations of organic vapors. A total of 24 samples (including duplicates) were submitted to RECRA for analysis of TAL inorganics, TCL VOCs, TCL SVOCs, TCL PCBs/pesticides, and pH.

Eighteen organic and two inorganic constituents had maximum detected concentrations exceeding the default USEPA SSLs. Five organic and two inorganic constituents were detected at concentrations exceeding the Region III RBCs for both industrial and residential soil, while 11 constituents have maximum detected concentrations that exceed the RBCs for residential soil only.

Twenty-two of the organic constituents detected above USEPA SSLs are in the samples collected from boring 07-GP-01. Alpha- and beta-BHC exceed the USEPA SSLs in the surface, shallow subsurface and deep subsurface samples in most of the borings. The SVOCs hexachlorobutadiene and hexachlorocyclopentadiene exceed the USEPA SSLs in borings 07-GP-01 and 07-GP-02 from the surface to depth and in 07-GP-03 in the deep subsurface sample (8 to 10 ft-bgs). The majority of detections of organic compounds above Region III industrial soil RBCs were limited to boring 07-GP-01. All other samples that exceed screening criteria are from various borings and depths.

Sixty Six constituents have maximum detection limits which exceed the default USEPA SSLs. In addition, 36 organic constituents have maximum detection limits which exceed the Region III RBCs for

both industrial and residential soil, while 27 organics have maximum detection limits which exceed the RBCs for residential soil only. Although the maximum detection limits for many of these constituents are elevated above desirable limits, there are numerous samples with reasonable detection limits. The elevated detection limits are associated with samples where similar constituents were detected and a dilution performed to quantify the detects.

SSLs were derived for SWMU 7-1 using site-specific data to evaluate if the constituents detected at concentrations exceeding the default USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds USEPA SSLs. Maximum detected concentrations of constituents were then compared to the site-specific SSLs.

Analytical results indicated that eight of the organic constituents (alpha-BHC, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane, bromomethane, methylene chloride, tetrachloroethene, trichloroethene, hexachlorobutadiene and hexachloroethane) have maximum detected concentrations exceeding the site-specific SSLs.

The data set for SWMU 7-1 was sorted to evaluate soils to which an industrial worker (0 to 2 ft-bgs) and a construction worker (0 to 5 ft-bgs) could be exposed. These data sets were compared to the Region III RBCs for industrial soil. The results of these comparisons show only arsenic and beryllium exceeding the industrial RBC in the 0 to 2 ft-bgs interval and arsenic, beryllium, hexachlorobenzene, hexachlorobutadiene, and tetrachlorethene in the 0 to 5 ft-bgs interval. The mean detections of both arsenic and beryllium in surface soil are within background concentrations for these constituents and therefore present no increased risk to the industrial worker in the soil contact pathways.

For the construction worker, the five constituents exceeding industrial RBCs were identified as COIs for SWMU 7-1. A site-specific risk assessment was performed for the construction worker scenario.

The results of the site-specific risk assessment for SWMU 7-1 indicate that the hazard index and theoretical excess lifetime cancer risk for a construction worker are 2.8 and 3×10^{-6} , respectively. The cancer risk was within the acceptable range of risks (10^{-6} to 10^{-4}) according to the USEPA; however, the hazard index slightly exceeded the benchmark of one.

The conservative site-specific SSL calculation indicated that there are organic constituents that could potentially migrate from the soil to groundwater at levels exceeding conservative risk-based criteria. However, the groundwater beneath this SWMU is contained on-site through pumping of production wells. Therefore, no further action is warranted for groundwater concerns in SWMU 7-1.

The site-specific risk assessment for the construction worker indicated non-cancer hazards may slightly exceed USEPA benchmarks. However, the elevated concentrations are to be isolated to a single location and would not present a concern when averaged over the whole SWMU area. As a result, no further action is warranted for the soil contact pathways at this SWMU.

AOC 7-1A: R&D AREA NORTHEAST OF LABORATORY BUILDING

AOC 7-1A, the research and development area located northeast of the laboratory building, consists of a vacant area where small buildings and pilot plants were once located. Surface soils in this area are mainly comprised of gravel fill material. The DOCC reported soil staining is present on the ground surface (ICF Kaiser, 1992). A fuel oil tank is located adjacent to an old, 45-foot by 100-foot concrete floor slab. The tank is contained with an earthen dike. Absorbent pads are used to collect oil from any free-standing liquids.

Various materials produced in this area include the following:

- titanium tetrachloride (1956-1957)
- oxychlorinated hydrocarbons
- 200 gallons of bis(2-ethylhexyl)p-phenylene (1959)
- maleic anhydride (1957)
- polyether polyol (1959-1963)
- polychloropentanes (hexachlorocyclopentadiene)

The investigation of AOC 7-1A consisted of a soil gas survey performed during Phase 1 and a soil sampling program performed during Phase 2 of the RFI.

A soil gas survey (RFI Phase 1, Task 2) was conducted by PPG on a voluntary accelerated schedule at AOC 7-1A in the fall of 1994 (ICF Kaiser 1995b and 1996d). A total of 52 soil gas samples were collected from 33 locations at depths of 2.5 ft-bgs (21 samples), 10 ft-bgs (26 samples), 15 ft-bgs (2 samples), 30 ft-bgs (1 sample), 40 ft-bgs (1 sample), and 50 ft-bgs (1 sample).

Twenty-four VOCs, primarily tetrachloroethene, vinyl chloride, trichloroethene, 1,2-dichloroethane, 1,2-dichloroethene, and 1,1-dichloroethene, were detected in the soil gas samples collected in AOC 7-1A. Potentially elevated concentrations of total VOCs were found in a radial pattern centered on a sampling location at the northeast corner of the concrete pad in AOC 7-1A. The maximum total VOC concentration from 2.5 ft-bgs measured 1,910 ug/l; from 10 ft-bgs, 86,900 ug/l; from 40 ft-bgs, 18,600 ug/l; and from 50 ft-bgs, 1,440 ug/l.

The Phase 2 investigation of AOC 7-1A consisted of three soil borings (07-TB-01, 07-TB-02, and 07-TB-03) completed using a HSA drill rig and continuous split-spoon sampling. Borings 07-TB-01 and 07-TB-03 were advanced to groundwater; boring 07-TB-02 did not reach groundwater, but was halted at 76 ft-bgs. Samples were collected from the surface (0 to 2 ft-bgs), shallow subsurface (3 to 5 ft-bgs) and deep subsurface (54 to 55 ft-bgs in 07-TB-01, 74 to 76 ft-bgs in 07-TB-02, and 72 to 74 ft-bgs in 07-TB-03). Ten samples (including a duplicate sample) were submitted to RECRA and analyzed for TAL inorganics, TCL VOCs, TCL SVOCs, and TCL PCBs/pesticides.

Two inorganic constituents (beryllium) revealed maximum detected concentrations which exceeded the Region III RBCs for both industrial and residential soil, while two organics and one inorganic (iron) have maximum detected concentrations which exceeded the RBCs for residential soil only. Ten organic and two inorganic constituents have maximum detected concentrations that exceed the default USEPA SSLs.

The majority of the organic constituents detected at concentrations above USEPA SSLs are in the surface, shallow subsurface (3 to 5 ft-bgs) and deep subsurface (74 to 76 ft-bgs) samples from boring 07-TB-02. At 07-TB-01, alpha-BHC concentrations exceeded the USEPA SSL in the surface, shallow subsurface and deep subsurface (54 to 55 ft-bgs) samples. At 07-TB-03 the concentration of alpha-BHC is above the USEPA SSL in the surface sample and 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane, tetrachloroethene, and trichloroethene exceeded the SSL in the deep subsurface (72 to 74 ft-bgs) sample. All other samples exceeding screening criteria are from various borings and depths.

Twelve constituents have maximum detection limits which exceed the Region III RBCs for residential soil, while no constituents have maximum detection limits which exceed the RBCs for industrial soil. In addition, 17 organic constituents have maximum detection limits which exceed the default USEPA SSLs. However, the detection limits are within those normally achievable by the analytical methods and are not considered elevated

SSLs were derived for AOC 7-1A using site-specific data to further evaluate if the constituents detected at concentrations exceeding the default USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the default USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs.

Analytical data revealed that the maximum detected concentrations of 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, tetrachloroethene and trichloroethene exceeded the site-specific SSLs.

The data set for AOC 7-1A was sorted to evaluate soils to which an industrial worker (0 to 2 ft-bgs) and a construction worker (0 to 5 ft-bgs) could be exposed. These data sets were compared to the Region III RBCs for industrial soil. The results of these comparisons show that only arsenic exceeds the Region III industrial RBC in the 0 to 2 ft-bgs interval and arsenic and beryllium in the 0 to 5 ft-bgs interval.

Currently the AOC is vacant and mostly unused with the exception of a fuel oil storage tank adjacent to the area which requires occasional maintenance. Therefore, workers have little contact with this AOC. The mean detections of both arsenic and beryllium in the soils at this AOC are just slightly above background levels; therefore these constituents pose no increased risk to the occasional worker via the soil contact pathways.

Although the analytical results for AOC 7-1A show concentrations that exceed USEPA industrial RBCs, most of the constituent concentrations exceeding the industrial RBCs are at depths at which direct soil contact will not occur. Analysis of shallow soil samples shows only arsenic beryllium detected at concentrations greater than Region III industrial RBCs. These constituents are present at concentrations similar to background levels. Therefore, contact with soil by a site worker is unlikely to present any increased risk. Based upon this evaluation, no further action is warranted at AOC 7-1A for the soil contact pathways.

Land use at the PPG Natrium facility is clearly industrial and will remain so for the foreseeable future. Therefore, constituents detected at concentrations greater than the residential RBCs are not of concern. The evaluation of the potential for leaching from soil to groundwater indicated that there are several organic constituents with maximum detections that exceed the site-specific SSLs. However, the mean detected concentrations of these constituents are less than the site-specific SSLs. In addition, the groundwater beneath this SWMU is contained on-site by pumping. Therefore, no further action is warranted for groundwater beneath AOC 7-1A.

START HERE

AOC 8-1A: FORMER BHC PRODUCTION AREA

The BHC Production Facility was removed from service in the late 1950's or early 1960's. The location of the former facility is now part of the chlorine production area. The entire AOC is paved with either asphalt or concrete. The existing building is currently used as a storage area and as a diaphragm production area.

Several research and development pilot plants were also located in this area. These plants produced:

- vinyl chloride,
- BHC (hexachlorocyclohexane isomers),
- monochlorinated benzene, and
- aniline.

The AOC is approximately 58,000 ft² in area and houses four buildings and several tanks.

This AOC was investigated during Phases 2 and 3 of the RFI. Five borings (08-TB-14 through 08-TB-18) were installed in AOC 8-1A using a HSA drill rig and continuous split-spoon sampling. All five borings were advanced to a depth of 20 ft-bgs and samples were collected for laboratory analysis from the surface (0 to 2 or 1 to 3 ft-bgs, depending on ground cover), shallow subsurface (3 to 5 ft-bgs) and deep subsurface (18 to 20 ft-bgs). Sixteen samples (including one duplicate sample) were submitted to the laboratory. Samples collected in AOC 8-1A were analyzed for TCL VOCs, TCL SVOCs, and TCL pesticides. In order to delineate BHC identified in the soil during Phase 2 of the RFI, 19 Geoprobe borings and four hand borings were completed during the Phase 3 sampling effort at AOC 8-1A. From these borings, 81 soil samples and seven duplicate soil samples were collected and screened for BHC. Ten of these samples were collected as split samples and were analyzed for TCL pesticides by Quanterra. Additionally, one of the split samples was collected as a duplicate and was also analyzed for TCL pesticides.

Twelve organic constituents have maximum detected concentrations that exceed the USEPA default SSLs. Four organic constituents were detected at concentrations exceeding the Region III RBCs for both industrial and residential soil and three organics have maximum detected concentrations that exceed the RBCs for residential soil only.

The highest detections of the BHC isomers were from shallow samples collected at boring N08-TB-14. Although VOCs and SVOCs were detected at levels above default SSLs and residential RBCs, they were not detected at concentrations exceeding industrial RBCs.

Although the maximum detection limits for some of these constituents are elevated above desirable limits, there are numerous samples with reasonable detection limits. The elevated detection limits are associated with samples where similar constituents were detected and a dilution performed to quantify the detects.

SSLs were derived for AOC 8-1A using site-specific data to evaluate whether the constituents detected at concentrations exceeding the USEPA default SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeded USEPA SSLs. Maximum detected concentrations were then compared to the site-specific SSLs. Four organic constituents (alpha-BHC, beta-BHC, gamma-BHC, and n-nitroso-di-n-propylamine) have maximum detected concentrations exceeding the site-specific SSLs.

The data set for AOC 8-1A was sorted to evaluate soils to which an industrial worker (0 to 2 ft-bgs) and a construction worker (0 to 5 ft-bgs) could be exposed. These data sets were compared to the Region III RBCs for industrial soil. The results of these comparisons show that four constituents exceed the Region III RBCs for industrial soil: alpha-, beta-, delta-, and gamma-BHC. These constituents were identified as COIs for AOC 8-1A. Therefore, site-specific risk assessments were performed for both the industrial worker and construction worker scenarios.

Due to the nature of this AOC, contact by site workers does not occur on a daily basis. In addition, contact with soils is precluded by the presence of pavement or buildings over the majority of the SWMU. Therefore, the standard exposure factor for a worker of 250 days/year (USEPA, 1991) is inappropriate and overly conservative. The exposure frequency has been adjusted to 100 days/year (two days per week; 50 weeks per year, which is still quite conservative) for the industrial worker. The results of the site-specific risk assessment for AOC 8-1A indicate that the hazard index for the industrial worker is 0.09 and for a construction worker is 0.4. Although the resulting hazard indices are acceptable (less than one), the cancer risks for both receptors slightly exceed the acceptable target (risks within the range of 10^{-6} and 10^{-4}) according to the USEPA (1989a). Due to the physical conditions in AOC 8-1A, it is extremely unlikely that a site worker would contact the soils in this area. The area within this AOC is either paved or contains buildings precluding contact with the soils. PPG has put institutional controls in effect in this area to prevent exposure to the soil. Therefore, the risks presented above are purely hypothetical since the exposure assumptions used are not likely to occur.

The results of the site-specific risk assessment for AOC 8-1A indicate that the hazard indices for the industrial and construction workers are 0.09 and 0.4, respectively. These results are within acceptable levels; however the theoretical excess lifetime cancer risks for these receptors slightly exceed the acceptable range of 10^{-6} to 10^{-4} . This AOC is in a process area that is entirely paved, so incidental exposure to these soils does not occur. This AOC has been included in the USEPA-approved Institutional Control Plan further limiting potential worker exposure. The plan has established training and work practices to ensure worker safety.

AOC 8-2A: GASOLINE STORAGE FACILITY

AOC 8-2A consists of the area in the vicinity of an above-ground, steel storage tank which contains gasoline. This tank is surrounded by a 2-foot concrete dike and rests on a concrete base. The diked area is approximately 20 feet by 48 feet. There are no cracks in the dike and the tank is in good condition. The tank is situated on concrete supports and is approximately 30 feet long and 6 feet in diameter, resulting in a capacity of about 6,300 gallons. This tank was installed in 1985.

AOC 8-2A was investigated during Phase 2 of the RFI. The investigation consisted of a soil sampling program. Samples were collected from two Geoprobe™ borings (08-GP-123 and 08-GP-124). The borings were advanced to 5 ft-bgs and samples were collected for laboratory analysis from the surface (0 to 2 ft-bgs) and 3 to 5 ft-bgs. Five samples (including a duplicate) were submitted to RECRA for analysis of BTEX, TOX, and TPH.

Constituents are not present in AOC 8-2A soil samples at concentrations that exceed the default USEPA SSLs or residential or industrial screening criteria. Constituent detection limits do not exceed the screening criteria for either residential or industrial soil. The detection limit for benzene slightly exceeds the default USEPA SSL. However, the detection limit for benzene is within those normally achievable by the analytical method and is not considered elevated.

USEPA, PPG, and ICF Kaiser held a telephone conference call on September 26, 1997 to discuss the RFI data collected at AOC 8-2A. In the telephone conference call, USEPA agreed that no further action is necessary for AOC 8-2A.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this AOC. Also, comparison of the maximum constituent concentrations to the USEPA criteria for residential and industrial soil shows there is no concern related to the soil contact pathways. As a result, no further action is warranted for AOC 8-2A.

AOC 8-3A: CAUSTIC TANK CAR AND TRUCK LOADING AREAS

AOC 8-3A consists of separate trailer truck and railroad tank car loading facilities. The truck loading area is concrete paved and has sump collection of wastewater. The railroad tank car facility is 660 feet long and was installed in 1943. The containment was installed in the 1980s. Currently, any discharges are captured by a series of 24 sumps along the rail car loading area (12 on each side). The wastewaters collected in these sumps are either reused in the caustic process or pumped to the weak caustic storage tanks.

AOC 8-3A was investigated via a soil sampling program during Phase 2 of the RFI. Four Geoprobe borings (08-GP-125 through 08-GP-128) were completed in the Truck Loading area in AOC 8-3A. Each Geoprobe boring was advanced to a depth of 5 ft-bgs and samples were collected from the surface (0 to 2 or 1 to 3 ft-bgs, depending on ground cover) and shallow subsurface (3 to 5 ft-bgs). In addition, one boring (08-TB-19) was advanced into the subsurface using a HSA drill rig and continuous split-spoon sampling. The HSA boring was advanced to 7 ft-bgs and samples for laboratory analysis were collected from the surface (0 to 2 ft-bgs) and 3 to 5 ft-bgs.

In the Tank Car Loading area of AOC 8-3A, eight Geoprobe borings (08-GP-129 through 08-GP-136) were advanced to a depth of 5 ft-bgs and samples for laboratory analysis were collected from the surface (0 to 2 or 1 to 3 ft-bgs, depending on ground cover) and shallow subsurface (3 to 5 ft-bgs). One HSA boring, 08-TB-20, was advanced to 7 ft-bgs and samples for laboratory analysis were collected from the surface (0 to 2 ft-bgs) and 3 to 5 ft-bgs. Thirty samples (including duplicates) were submitted to RECRA for analysis of mercury, sodium, and pH. Two Shelby tube and associated jar samples each were collected from 08-TB-19 and 08-TB-20 in the 1 to 3 and 5 to 7 ft-bgs intervals. The samples were analyzed for the geotechnical/general engineering parameters CEC, TOC, grain size distribution, hydrometer, bulk density, permeability, and moisture content.

The results of a comparison of the maximum detected concentrations and detection limits to the default USEPA SSLs and Region III industrial and residential RBCs indicate that constituents are not present in AOC 8-3A soil samples at concentrations that exceed the USEPA screening criteria. Therefore, no further action is necessary for AOC 8-3A.

6.1 AOC 8-4A: GRAPHITE CELL CONSTRUCTION AREA

AOC 8-4A consists of a concrete paved area of approximately 1600 feet² which was formerly used for refitting lead/graphite asbestos cells. Releases of lead-containing wastewater may have occurred. During the rebuilding of the cells, lead and tin mastic releases occurred. Solvents were used to remove the mastic from the concrete.

AOC 8-4A was investigated during Phase 2 of the RFI. Three Geoprobe borings (08-GP-137 through 08-GP-139) were advanced into the subsurface in AOC 8-3A. Each Geoprobe boring was advanced to a depth of 5 ft-bgs and samples were collected from the surface (0-2 ft-bgs) and shallow subsurface (3-5 ft-bgs) for submittal to the laboratory. In addition, two borings (08-TB-21 and 08-TB-22) were advanced into the subsurface using a HSA drill rig and continuous split-spoon sampling. The HSA borings were advanced to 7 ft-bgs and samples were collected from the surface and shallow subsurface. Twelve samples (including duplicates) were submitted to RECRA for analysis of lead.

There are no USEPA default criteria for the parameters analyzed. However, lead is present at a maximum concentration of 1,190 mg/kg, which exceeds the benchmark maximum screening value for residential (400 mg/kg) and industrial soil (800 mg/kg). To further evaluate the presence of lead, the average concentration of the 10 samples was calculated and determined to be 184 mg/kg.

USEPA, PPG, and ICF Kaiser held a telephone conference call on September 18, 1997 to discuss the RFI data collected at AOC 8-4A. In the telephone conference call, USEPA agreed that no further action is necessary for AOC 8-4A, pending USEPA's review of the average lead concentration in surface soil samples and a description of the activity in the area.

The potential constituent of concern at this AOC is lead. The concentration of lead in only 1 of the 10 soil samples collected at this AOC exceeds the default industrial (800 mg/kg) and residential (400 mg/kg) screening values. As a result, the detection of lead at concentrations exceeding the residential and industrial screening levels is isolated and does not warrant further action.

AOC 8-5A: CHLORINE AREA (FORMER) ONCE THROUGH SEWER

This sewer system consists of concrete and vitrified clay pipes of various diameters; however, the majority of the piping in this storm sewer system has been removed. The storm sewer system connects to process sewers near the #6 and #7 chlorine circuits. In the past, process wastewater from the #6 and #7 chlorine circuits passed through this system and discharged directly into the Ohio River. The storm sewers still operate, but have been plugged so they can not accept process wastewaters. Waters entering the storm sewer system flow directly to NPDES permitted Outfall 009.

AOC 8-5A was investigated during Phase 2 of the RFI. Forty borings (08-GP-140 to 08-GP-179) were advanced into the subsurface within the production area and five Geoprobe borings along the common sewer. The borings were advanced to 2 to 4 feet below the bottom of the nearby sewer. Samples were collected from the surface (0 to 2 ft-bgs), the shallow subsurface (3 to 5 ft-bgs), and the deep subsurface (the bottom 2 to 4 feet of each boring). One hundred forty samples (including 6 duplicates) were submitted to RECRA for analysis of TAL inorganics, TCL VOCs, TCL SVOCs, chlorides, and pH.

Three organic constituents (benzo(a)anthracene, benzo(a)pyrene and benzo(b)fluoranthene) and three inorganic constituents (arsenic, beryllium and lead) have maximum detected concentrations that exceed the Region III RBCs for both industrial and residential soil. Four organics (tetrachloroethene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene and N-nitroso-di-n-propylamine) and four inorganics (barium, iron, manganese and mercury) have maximum detected concentrations that exceed the RBCs for residential soil only.

Seventeen organic and six inorganic constituents have maximum detected concentrations that exceed the default USEPA SSLs. VOCs and SVOCs detected above the screening criteria were found throughout the surface, shallow subsurface, and deep subsurface samples. Inorganics detected above the screening criteria were found primarily in surface samples with occasional detections in shallow and deep subsurface samples.

Four organic constituents have maximum detection limits that exceed the Region III RBCs for both industrial and residential soil. Seven organics have maximum detection limits that exceed the RBCs for residential soil only. In addition, 26 organic constituents have maximum detection limits which exceeded the default USEPA SSLs.

SSLs were derived for this AOC using site-specific data to determine if the constituents detected at this AOC have the potential to migrate from soil to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the default USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs.

1,1,2,2-Tetrachloroethane, tetrachloroethene, and n-nitroso-di-n-propylamine are the only constituents that exceed the site-specific SSLs. However, these constituents do not warrant further evaluation due to

either an extremely low frequency of detection (1 of 119 samples for N-nitroso-di-n-propylamine and 9 of 118 for 1,1,2,2-tetrachloroethane), or because the detections are just slightly above conservative site-specific SSLs (as with tetrachloroethene).

The soils in the 0 to 2 ft-bgs interval were compared to the Region III RBCs for industrial soil. The result of this comparison shows only arsenic, beryllium, lead, benzo(a)anthracene, benzo(a)pyrene and benzo(b)fluoranthene exceeding the industrial RBCs in the 0 to 2 ft-bgs interval. The mean detections of arsenic, beryllium and benzo(a)pyrene exceed the RBCs for industrial soil. The mean concentrations of arsenic and beryllium are similar to background concentrations. The mean detections of lead, benzo(a)anthracene and benzo(b)fluoranthene are below the Region III RBCs for industrial soil, with localized peak detections, which suggests that these constituents are not present at unacceptable levels throughout the unit. Additionally, benzo(a)anthracene and benzo(b)fluoranthene are primarily found at shallow depths and may be associated with the asphalt pavement which covers this area. No other industrial activity is present within the AOC. For these reasons, the potential for exposure to industrial workers on a regular basis is extremely unlikely and would not pose an unacceptable risk to site workers.

The arsenic concentrations elevated above background correlate with materials identified as fly ash or fill materials which may contain fly ash. Therefore, the elevated arsenic concentrations are believed to be associated with fly ash. Additionally, all of the elevated arsenic concentrations were detected beneath paved areas where incidental contact will not occur.

Several constituents are present at concentrations that exceed the residential RBCs but the current and likely future land use for the Natrium site is industrial. To fulfill USEPA's requirement to consider future residential land use, PPG agreed to map concentrations greater than residential RBCs.

Although the analytical results for AOC 8-5A shows concentrations of constituents that exceed the USEPA industrial RBCs, most of the constituent concentrations exceeding the industrial RBCs are at depths at which direct soil contact will not occur. Analysis of surface soil samples shows only arsenic, beryllium and benzo(a)pyrene with mean concentrations greater than Region III industrial RBCs. The mean arsenic and beryllium concentrations are similar to background and the highest benzo(a)pyrene concentration was detected in samples collected directly beneath asphalt. Based upon this evaluation, the soil contact pathways are not a concern at this AOC.

The conservative site-specific SSL calculation indicated that there are several organic constituents that could potentially migrate from the soil to groundwater at levels exceeding conservative risk-based criteria. However, the groundwater beneath this AOC is entirely contained through on-site pumping of PPG's production wells. Therefore, no further action is warranted for groundwater concerns at AOC 8-5A. As a precautionary measure, PPG has included areas of this AOC encompassing the samples which exhibited elevated arsenic, beryllium, and benzo(a)pyrene concentrations in the USEPA approved Institutional Control Plan.

6.2 AOC 8-6A1: CAUSTIC SIX PACK

AOC 8-6A consisted of all the tanks in the caustic department; however during the RFI process, this AOC was divided into two areas based on location. AOC 8-6A1 consists of a group of six, 835,000 gallon capacity, above-ground storage tanks located near Skyline Drive in the caustic department, commonly referred to as the six-pack. These tanks contain caustic and brine solutions.

AOC 8-6A1 was investigated during Phase 2 and 3 of the RFI.

Four Geoprobe borings and two hand auger borings (08-GP-187 through 08-GP-190, and 08-SB-11 and 08-SB-12), were advanced into the subsurface in AOC 8-6A1. Each Geoprobe boring was advanced to a depth of 5 ft-bgs and samples were collected from the surface (0 to 2 ft-bgs) and shallow subsurface (3 to 5 ft-bgs). Thirteen soil samples (including one duplicate) were submitted to RECRA Laboratory for analysis of mercury, sodium, chloride, and pH.

Three soil borings (08-GP-200 through 08-GP-202) were completed to a depth of 20 feet during Phase 3 of the RFI. Samples were collected at the following intervals in each of the borings: 0 to 2, 3 to 5, and 18 to 20 ft-bgs. The samples were analyzed for mercury by Quanterra Laboratory.

No constituents were detected at concentrations exceeding the USEPA Region III RBCs for industrial or residential soil. In addition, there were no constituents which had maximum detection limits which exceeded the RBCs for either industrial or residential soils.

One constituent (mercury) was detected at a maximum concentration exceeding the default USEPA SSL. Mercury concentrations exceed the SSL in 4 of the 22 samples analyzed for this parameter. Mercury concentrations exceed the USEPA SSL in the shallow subsurface (3 to 5 ft-bgs) sample of boring 08-SB-11 and in both the surface and shallow subsurface samples from boring 08-SB-12. These borings are both located in the interior of the Caustic Six Pack area.

A site-specific SSL was derived for AOC 8-6A1 to further evaluate if mercury concentrations exceeding the USEPA SSLs could potentially migrate to groundwater at levels of concern. Analytical results indicated that mercury concentrations did not exceed the site-specific SSL.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this AOC. Also, the comparison of mercury concentrations to the Region III RBC for industrial soil shows there is no concern related to the soil contact pathways. As a result, no further action is warranted at AOC 8-6A1.

AOC 8-6A2: SOUTH CAUSTIC STORAGE TANKS

AOC 8-6A2 consists of approximately thirty, above-ground storage tanks located in the southern portions of the caustic department which contain or were previously used to store caustic solutions. Capacities of these tanks range from less than 20,000 to 835,000 gallons.

AOC 8-6A2 was investigated during Phase 2 of the RFI. Eleven soil borings were completed in AOC 8-6A2 to a depth of 5 ft-bgs. Soil samples were collected from the following intervals: 0 to 2, and 3 to 5 ft-bgs. These samples were analyzed by RECRA for mercury, sodium, and chloride.

No constituents have maximum detected concentrations exceeding the USEPA Region III RBCs for industrial or residential soil. One constituent (mercury) is present with a maximum detected concentration exceeding the default USEPA SSL. The concentrations of mercury exceeds the default USEPA SSL in 1 of the 21 samples analyzed for this parameter.

A site-specific SSL was derived for AOC 8-6A2 to further evaluate if the mercury concentration exceeding the USEPA SSL could potentially migrate to groundwater at levels of concern. Analytical results indicated that the mercury concentrations do not exceed the site-specific SSL.

Comparison of soil analytical data to the site-specific SSL indicates that there is no concern related to migration of detected constituents from soil to groundwater at this AOC. Also, the comparison of

mercury concentrations to the Region III RBC for residential and industrial soil shows there is no concern related to the soil contact pathways. As a result, no further action is warranted at AOC 8-62A.

AOC 8-7A: Former Oil Storage Tanks

This AOC is the former location of two above ground storage tanks, north of the #5 chlorine circuit. The tanks, each with a capacity of 1,250 gallons, were approximately 30 years old when they were removed by PPG in May 1994. A concrete dike (20 by 25 feet, 16-inches high, 6-inches thick) surrounded the tanks. A small electrical switch building bounds the AOC on the eastern side. The area around and under the former location of the tanks is covered with sand and gravel. The area outside the dike is paved with asphalt.

A field investigation and interim measure were conducted at AOC 8-7A on a voluntary, accelerated schedule by PPG in 1994. The results of the investigation were provided to USEPA in a document entitled "Interim Action and Investigation Report for Selected RFI SWMUs and AOCs" (ICF Kaiser, 1996b) and an executive summary document (ICF Kaiser, 1996h). The interim action at this AOC removed all soil visibly stained with TPH or exhibiting elevated OVM readings above 1 part per million (ppm) within the diked area. Soils beneath the building foundation located on the northeast side of the diked area could not be excavated due to safety concerns.

Five soil borings (08-GP-05 through 08-GP-09) were completed to a maximum depth of 14 ft-bgs in the vicinity of AOC 8-7A after the excavation was completed. Sixteen soil samples from these borings were field screened for TPH. Two of these samples were collected as split samples. These split samples were analyzed for TPH, BTEX, and SVOCs. An additional two feet of soil was excavated from within the diked area after the soil borings were completed. A composite sample (08-SE-14) was collected after the excavation was completed and was analyzed for TPH.

Three constituents (TPH, Total PCB and Aroclor 1260) had maximum detected concentrations exceeding both the Region III RBCs for industrial and residential soil. However, post excavation samples show that remaining concentrations of PCBs range from 0.098 to 0.49 mg/kg and concentrations of TPH range from 220 to 260 mg/kg. These concentrations are well below the screening criteria. No constituents had maximum detected concentrations which exceeded the default USEPA SSLs.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. Also, the comparison of constituent concentrations to the Region III RBCs for industrial soil shows there is no concern related to the soil contact pathway. As a result, no further action is recommended for AOC 8-7A.

SWMU 8-4: CHLORINE COOLING/DRYING SYSTEM

SWMU 8-4, the chlorine cooling/drying system, was installed in 1984 and cools saturated chlorine in a staged non-contact cooling process and in the process removes water vapor. After the chlorine is cooled, a 92% sulfuric acid solution is used to extract water remaining in the chlorine stream. Condensate from the system is pumped directly to a vacuum recovery unit to recover chlorine.

Water, which is condensed from the chlorine, is collected in a saturation tank. From this tank the water is pumped to a chlorine header to strip chlorine gas left in the condensate. A packed tower then strips out any chlorine left in the final condensate. The water is then sent to the pH collection system.

Line cleaning of this system occurs periodically. Waters containing sulfuric acid used for this type of cleaning are first discharged to a holding tank and then eventually to a NPDES outfall. The entire area is asphalt paved and contained by a 6-inch dike.

Three Geoprobe test borings (08-GP-11, 08-GP-12, and 08-GP-13) were installed in SWMU 8-4 during Phase 2 of the RFI. The borings installed in this area were advanced to 5 ft-bgs. One sample each was collected from the 0 to 2 ft-bgs and the 3 to 5 ft-bgs interval in each boring. Samples were collected from the shallow soil intervals since impacts in the area would have been associated with surface spills and would be evident in the shallow samples. A total of seven samples (including duplicates) were collected in this SWMU. Samples collected in SWMU 8-4 were submitted to the laboratory for analysis of pH, sulfate, and chloride. This SWMU does not have detected constituent concentrations or constituent detection limits that exceed the industrial or residential RBCs or default USEPA SSLs, and therefore requires no further action.

SWMU 8-5: LEAD/ASBESTOS TREATMENT SYSTEM

SWMU 8-5 consists of the Lead/Asbestos Treatment System. When lead/graphite electrodes were used at the PPG Natrium facility, cleaning/maintenance of the asbestos diaphragm cells produced a lead/asbestos slurry. This slurry was pumped to a treatment system consisting of a surge tank, a clarifier where NaSH was added to promote precipitation of PbS, and filter presses where the asbestos and the PbS precipitate were dewatered. Both the PbS sludge and dewatered asbestos were transported off-site to a hazardous waste landfill. The filtrate was neutralized and discharged to NPDES Outfall 009. Prior to 1977, the wastewater generated during maintenance was discharged directly to the Ohio River. Lead waste is no longer generated at the plant, but the tanks remain in service as part of the asbestos treatment system and brine treatment system. The tanks collected lead wastewater from 1975 until their decontamination in 1986.

The investigation of SWMU 8-5 was performed as part of Phase 2 of the RFI and consisted of the soil samples collected from four test borings. Three of these borings (08-GP-14, 08-GP-15 and 08-GP-16) were installed with the Geoprobe, and the fourth (08-SB-01) was installed using a hand auger. One sample each was collected from the 0 to 2 ft-bgs and the 3 to 5 ft-bgs intervals from each boring. Soil samples were collected from shallow soil intervals since impacts in the area would be expected to be introduced from the surface and would be evident in the shallow soil sample results. A total of 10 samples (including two duplicates) were collected from the four borings installed in SWMU 8-5. These samples were analyzed for pH, chloride, and lead.

This SWMU does not have detected constituent concentrations or constituent detection limits that exceed the industrial and residential RBCs or default USEPA SSLs. Therefore SWMU 8-5 requires no further action.

SWMU 8-6: OIL STORAGE TANK AREA (FOR #1 BRINE FIELD DEVELOPMENT)

Two above-ground steel storage tanks were located in this area. The tanks were located on a concrete foundation with a 2-foot high concrete dike. These tanks stored a mixture of various oils used for brine well development in the No. 1 brine field area until 1983. Removal of the tanks occurred early in 1993. The tanks were 8 to 10 foot in diameter with heights of 15 feet and 12 feet. The area surrounding the concrete pad is gravel covered.

PPG conducted an investigation and interim action work at SWMU 8-6 on a voluntary, accelerated schedule between May 1994 and June 1995. The results of the investigation and interim action work

were provided to USEPA in a document entitled "Interim Action and Investigation Report for Selected RFI SWMUs and AOCs", and a separate executive summary document (ICF Kaiser, 1996g.)

The investigation and interim action of this SWMU consisted of characterization sampling, soil excavation, confirmatory sampling, additional soil excavation, and the final round of confirmatory sampling. The characterization sampling consisted of a composite sample collected from depths of 0 to 1 ft-bgs at seven discrete locations within the diked area. This sample was analyzed by for TPH, VOCs, SVOCs, PCBs, and TCLP metals.

The interim action at this SWMU removed all soil visibly stained with TPH or exhibiting elevated OVM readings. The soil within the bermed area was excavated to a depth of approximately 3 feet. The top two feet of soil consisted of stained sand and gravel. Approximately 1 foot (2-3 ft-bgs) of brown to grayish brown silty clay was also excavated until there was no visible oil staining. The total amount of soil excavated during the interim action was approximately 100 cubic yards. A composite sample (08-SE-15) was collected from 7 discrete locations at the base of the excavation. This sample was analyzed for TPH. A second area north of the berm was excavated to 1 ft below grade. This area excavated was approximately 1,600 square feet in size. A composite sample (08-SE-16) was collected from seven discrete locations within this area. This sample was analyzed by for TPH. Total petroleum hydrocarbons were detected at a maximum concentration exceeding the screening criteria. However, individual components of TPH (e.g. BTEX and PAHs) were not detected at concentrations above Region III RBCs for soil. In addition, post excavation samples showed that the remaining concentrations of TPH ranged from 280 to 1,100 mg/kg, which is significantly less than the detection of 28,600 mg/kg from the Phase I characterization sample. There were no other organic constituents that exceeded either the USEPA Region III RBCs for industrial or residential soil, or the default USEPA SSLs.

Based all this information SWMU 8-6 is recommended for no further action.

SWMU 8-8: NON-MERCURY PROCESS SEWER, TRENCHES, AND SUMPS

SWMU 8-8 consist of the non-mercury process sewer, trenches, and sumps. Prior to the installation of the current sewer system in 1988, wastewaters discharged directly to the Ohio River. Construction materials include concrete trenches and a sump.

This unit includes all non-mercury process sewers and associated trenches and sumps located within the chlorine process area. Trenches collect wash waters that flow to sumps for collection. The largest quantity of wastewater collected by this system includes wastewater produced by the diaphragm cell process. Wastewaters from this process are treated to remove asbestos and heavy metals in the lead/asbestos treatment system. The water is discharged to the Ohio River after pH neutralization through NPDES Outfall 009.

SWMU 8-8 was investigated during Phase 2 of the RFI. Thirty-two test borings were installed utilizing the Geoprobe drilling method. Twenty-seven of these borings were installed in the process area. The remaining five borings were installed in the area of the common sewer. A total of 101 soil samples were collected from SWMU 8-8, including five duplicate samples.

All samples collected in SWMU 8-8 were analyzed for TCL VOCs, TCL SVOCs, chloride, and lead. Ninety-four of the samples were analyzed for Ph.

One inorganic constituent (lead) and two organics (benzo(a)pyrene and hexachlorobenzene) were detected at maximum concentrations exceeding the Region III RBCs for both industrial and residential soil. Five additional constituents were detected at concentrations exceeding the Region III RBC for

residential soil only. Fourteen constituents were detected at maximum concentrations exceeding the USEPA default SSLs.

Six constituents have maximum detection limits exceeding the Region III RBCs for industrial soil, and five have detection limits exceeding residential RBCs only. In addition, 30 constituents have maximum detection limits which exceeded the USEPA SSLs. An evaluation of the detection limits for samples collected in SWMU 8-8 revealed that none of the detection limits were elevated above the acceptable detection limits for the analytical methods used. Additionally, there is no evidence that any of the constituents with detection limits exceeding the screening criteria may be present in this SWMU.

Comparison of soil analytical data to SSLs and RBCs show that the maximum concentrations of a few constituents exceed these screening criteria. However, comparison of mean detected concentrations shows that average values do not exceed the screening criteria. Although there is one elevated detection of benzo(a)pyrene in surface soil, it is located beneath asphalt thus eliminating the potential for casual exposure. Therefore, no further action is recommended for SWMU 8-8.

SWMU 8-9: BRINE TREATMENT SYSTEM

SWMU 8-9, the brine treatment system, was installed in 1943 next to the lead/asbestos treatment system. This system purifies extracted brine for chlorine production. Caustics and carbonates are added to precipitate calcium and magnesium [CaCO_3 , CaO , Ca(OH)_2 , MgOH]. The precipitates settle out in three clarifiers. The brine is then passed through eight anthracite coal filters. Polished brine is held in the finished brine tank. Impurities filtered out of the brine leave the treatment system as brine mud. Brine mud is held in a holding tank until it is re-injected into a brine cavity through a permitted injection well.

Three test borings, (08-GP-49, 08-GP-50, and 08-SB-02) were installed during Phase 2 of the RFI using a Geoprobe rig. Samples from location 08-SB-02 were initially planned for collection with a hand auger, however the area was accessible with the Geoprobe. Samples were collected and analyzed for TOX, TPH, pH, and sulfide.

The maximum detected concentration of 2,176 mg/kg TPH exceeds the screening level of 1,000 mg/kg. The 2,176 mg/kg represents the average concentration from sample N08-GP049-0002 (2,950 mg/kg) and its duplicate (1,400 mg/kg). This concentration, although above the 1,000 mg/kg screening value, is believed to be associated with the asphalt that is directly above the sampled interval. Asphalt contains numerous constituents that would be detected by TPH analysis. The 3 to 5 ft-bgs soil interval at boring N09-GP-49 shows TPH less than the 1,000 mg/kg screening value. TOX sample concentrations in this area were reported as non-detect, indicating that the TPH values are not associated with halogenated organic compounds. Also, sitewide TPH data indicate specific VOCs and SVOCs concentrations are below levels of concern even where corresponding TPH results are in the tens-of-thousands mg/kg range.

Analytical results show that neither surface nor subsurface soils contain TOX. Surface and subsurface soil data indicate that TPH is present in only one sample exceeding the 1,000 mg/kg screening value. However, this sample was collected directly beneath the asphalt in the area, and the detected TPH is believed to reflect asphalt components. TPH soil data collected throughout the PPG Natrium site shows that even when TPH concentrations are tens of thousands of mg/kg, the concentration of specific constituents that comprise the TPH are below levels of concern. As a result, there is no concern related to migration of detected constituents from soil to groundwater at this SWMU nor is there a concern with the soil contact pathways. As a result, no further action is warranted for SWMU 8-9.

SWMU 8-12: MERCURY BRINE TREATMENT SYSTEM

The mercury brine treatment system was installed in 1957 and consists of a series of saturators, scrubbers, tanks, and filters, through which brine, used in the mercury cell process, passes to remove impurities and replenish the salt content. This is a closed-loop system, with spent brine regenerated and sometimes replenished with fresh brine. Regenerated brine is then reused in the mercury cells.

These rubber-lined tanks are constructed of carbon steel, and the DOCC reported them to be in fair condition (ICF Kaiser, 1992). The capacity of the tanks varies from 1,000 to 100,000 gallons.

The entire area for the mercury-brine storage tanks is asphalt paved. A six-inch high dike provides containment around five of the seven tanks. The DOCC reported that the paved embankment on the west side of the tanks is cracked. The paved embankment is inspected annually and repairs are made if any cracks are present.

The whole area where the treatment tanks are located, plant north of mercury-brine storage tanks, is paved. Three-inch high concrete dikes contain the pressure filters, caustic scrubbers, NaCl slurry tanks, and acid (HCl) storage tanks.

SWMU 8-12 was investigated during Phase 2 of the RFI. Thirteen soil borings (08-GP-51 through 08-GP-61 and 08-SB-03 and 08-SB-04) were installed in SWMU 8-12 using the Geoprobe. Twenty-five soil samples were collected from the borings. Samples were collected from the 0 to 2 ft-bgs interval at all thirteen locations and from the 3 to 5 ft-bgs interval at 10 of the locations. One sample was collected from the 5 to 7 ft-bgs interval at location 08-SB-04. The remaining sample (N08-GP051-0002D) was a duplicate. The samples were analyzed for pH and mercury.

The maximum concentration of 142 mg/kg mercury in soil samples collected at SWMU 8-12 exceeds the Region III residential RBC of 23 mg/kg for this constituent, but does not exceed the industrial RBC of 610 mg/kg. The maximum detected concentration of mercury is in the sample collected at 5 to 7 ft-bgs at boring 08-SB-04, at a depth where contact with the soil is unlikely. To further evaluate mercury detected in soil at the SWMU, the mean and median of detected concentrations was calculated and compared to the USEPA soil screening values. The mean and median values for both depths were below the residential RBC. The calculation is conservative because only samples where mercury is detected are used (i.e. non-detects are not considered).

The concentration of mercury exceeds the USEPA SSL in 5 of the 24 soil samples collected at this SWMU. In order to further evaluate the potential soil to groundwater migration pathway, a site-specific SSL was developed. Analytical results revealed that the maximum concentration of mercury does not exceed the site-specific SSL for SWMU 8-12. Comparison of the mercury soil analytical data to the site-specific SSL indicates there is no concern related to the migration of this constituent to groundwater at this SWMU. Also, comparison of maximum mercury concentrations to Region III industrial RBCs and average mercury soil concentrations to residential RBCs shows there is no concern related to the soil contact pathways. As a result, no further action is warranted for SWMU 8-12.

SWMU 8-14: MERCURY TREATMENT SYSTEM

The mercury treatment system consists of two large circular clarifiers (mercury settling tanks) with a diameter of 80 feet. The tops of the tanks are open to the atmosphere. The settling tanks are constructed of rubber-lined galvanized steel and are in good condition. The clarifiers are connected to a carbon adsorption filter, which is also open to atmosphere. Each filter has a diameter of 5 feet and is located in a concrete paved sump area, which is approximately 9 feet deep, and occupies an area of 1000 feet². An

area of approximately 20,000 feet² around the tanks is asphalt paved and the tanks are completely contained by berms approximately 3 feet high.

Mercury in wastewaters is removed by in-pump injection of NaSH to precipitate HgS, that is then removed in settling tanks and carbon filters. Treated wastewater is discharged to the Ohio River via NPDES Outfall 009. Settled sludge is removed when the tanks become full. Settled sludge is classified as RCRA waste code K106.

During Phase 2 of the RFI, eight borings (08-GP-62 through 08-GP-69) were drilled to a depth of 5 ft-bgs at SWMU 8-14 using the Geoprobe. Two samples were collected from each of the borings at surface (0 to 2 ft-bgs) and 3 to 5 ft-bgs. Eighteen samples (including two duplicates) were collected from the borings installed in this SWMU. Samples submitted to the laboratory were analyzed for mercury and sulfide. The 0 to 2 ft-bgs samples were actually collected beneath an asphalt or gravel surface covering.

Only one of 18 soil samples collected at this SWMU contained mercury at a concentration that exceeded the residential RBC. The maximum concentration of mercury (42 mg/kg) in the surface sample collected at location 08-GP-65 slightly exceeded the residential RBC of 23 mg/kg, but is well below the industrial RBC of 610 mg/kg. The surface where 08-GP-65 was drilled is covered with asphalt paving and as a result the soil is isolated from casual contact. To further evaluate mercury detected in soil at this SWMU, the mean, median, and mode of detected concentrations was calculated and compared to the USEPA soil screening values. The mean, median, and mode for surface and subsurface samples were below the residential RBC. The calculation is conservative because only samples where mercury was detected are used (i.e. non-detects are not considered).

The concentration of mercury exceeds the default USEPA SSL of 2 mg/kg in only one of the 18 samples from this SWMU. To further evaluate the potential soil to groundwater migration pathway, a site-specific SSL was developed for mercury as discussed in the following subsection.

A site-specific SSL was derived for SWMU 8-14 to further evaluate if mercury detected at a concentration exceeding the USEPA SSL has the potential to migrate to groundwater at a level of concern. Analyses indicated that the maximum concentration of 42 mg/kg is well below the site-specific SSL of 1,156 mg/kg.

Comparison of the mercury soil analytical data to the site-specific SSL indicates there is no concern related to the migration of this constituent to groundwater at this SWMU. Also, comparison of maximum mercury concentrations to Region III industrial RBCs and average mercury soil concentrations to residential RBCs shows there is no concern related to the soil contact pathways. As a result, no further action is warranted for SWMU 8-14.

SWMU 8-15: MERCURY PROCESS SEWER, TRENCHES, AND SUMPS

Original construction of the mercury process sewers and trenches occurred in 1957. Prior to the system being upgraded, mercury wastewaters were discharged to the mercury surface impoundment to allow settling of mercury contaminants prior to discharge to the Ohio River. The original process sewer system was constructed of concrete encased vitrified clay pipe. Since the upgrade in 1980, wastewater entering this system is first treated in the mercury treatment system to remove mercury as mercury sulfide sludge. The resulting treated wastewater passes through a carbon adsorption bed and is discharged to the Ohio River via NPDES Outfall 009. Waste materials produced by the mercury cell process include process wastewaters containing mercury, cleaning wastewaters, raw material and product spills.

Twenty-four test borings were installed at SWMU 8-15 during Phase 2 of the RFI using the Geoprobe. Sixty-eight soil samples were collected and analyzed for pH, chloride, sulfide, and mercury.

Five borings (08-GP-89 through 08-GP-93) were placed along the common sewer leading to NPDES Outfall 009. One sample was collected from each of these borings at 0 to 2 ft-bgs, 3 to 5 ft-bgs, the interval with highest field instrument reading, and the 2-foot interval below the bottom of the nearby sewer, trench, or sump. Sixteen samples plus one duplicate were collected from these borings.

Nineteen borings, 08-GP-70 through 08-GP-88, were installed near the process sewers within the mercury process area. One sample was collected from each of these borings at 0 to 2 ft-bgs, 3 to 5 ft-bgs, the interval with the highest field instrument reading, and the 2-foot interval below the bottom of the nearby sewer, trench, or sump. In borings 08-GP-78 through 08-GP-80, and 08-GP-83 through 08-GP-86 it was necessary to collect only two samples at each boring because of the shallow depth of the nearby sewer or drain. In addition to the investigative samples, two duplicate samples were collected

The maximum concentration of mercury (160 mg/kg) detected in soil at this SWMU exceeds the Region III RBC for residential soil, but does not exceed the RBC for industrial soil. Mercury concentrations exceed the residential RBC in only 4 of the 65 samples analyzed for this constituent. Two of the four mercury detects are in soil samples from the 0 to 2 ft-bgs interval, however, these samples were collected from beneath an area paved with asphalt and as a result the soil is isolated from casual contact. To further evaluate mercury detected in soil at this SWMU, the mean, median, and mode (if available) of detected concentrations was calculated and compared to the USEPA soil screening values. As indicated the mean, median, and mode for surface and subsurface samples are below the residential RBC. The calculation is conservative because only samples where mercury was detected were used (i.e. non-detects are not considered).

The concentration of mercury exceeds the default USEPA SSL of 2 mg/kg in 11 of the 65 soil samples from this SWMU. To further evaluate the potential soil to groundwater migration pathway, a site specific SSL was developed for mercury.

A site-specific SSL was derived for SWMU 8-15 to further evaluate if mercury detected at a concentration exceeding the USEPA SSL has the potential to migrate to groundwater at a level of concern. As indicated, the maximum detected mercury concentration of 160 mg/kg is well below the site-specific SSL of 607 mg/kg.

Comparison of the mercury soil analytical data to the site-specific SSL indicates there is no concern related to the migration of this constituent to groundwater at this SWMU. Also, comparison of maximum mercury concentrations to Region III industrial RBCs and average mercury soil concentrations to residential RBCs shows there is no concern related to the soil contact pathways. As a result, no further action is warranted for SWMU 8-15.

SWMU 8-16: DITCH BELOW MERCURY TREATMENT SYSTEM

SWMU 8-16 is a concrete ditch below the mercury treatment system that is approximately 3 feet wide and 190 feet long.

During Phase 2 of the RFI, six borings were installed at SWMU 8-16. Three of these borings (08-GP-94 through 08-GP-96) were installed using the Geoprobe. The remaining three borings (08-TB-01 through 08-TB-03) were installed using a HSA drill rig. Seventeen samples were collected from the borings installed in this SWMU, including two duplicate samples. Samples from borings installed with

the Geoprobe were collected from the 0 to 2 ft-bgs interval in borings 08-GP-94 and 08-GP-96 and from the 2 to 4 ft-bgs interval in 08-GP-95 (there was no recovery in the 0 to 2 ft-bgs interval).

Three samples each were collected from HSA borings 08-TB-01 and 08-TB-02 at 0 to 2 ft-bgs, 3 to 5 ft-bgs, and 18 to 20 ft-bgs. Because boring 08-TB-03 was elevated approximately 7 feet above borings 08-TB-01 and 08-TB-02, the sample intervals in 08-TB-03 were adjusted to correspond to the sample intervals in borings 08-TB-01 and 08-TB-02. Boring 08-TB-03 was drilled to a depth of approximately 7 ft-bgs before initiating sample collection in order to make the sampling intervals approximately equal to those in the other HSA borings. Shelby tube samples, each with an associated jarred sample, were collected from the 6 to 8 ft-bgs interval in boring 08-TB-01 and the 13 to 15 ft-bgs interval in 08-TB-03.

All samples were analyzed for mercury and selected samples for geotechnical parameters including grain size distribution, hydrometer, bulk density, permeability, moisture content, TOC, TOX, BTU value, percent ash, and flash point. It was necessary to re-sample the three Geoprobe borings and HSA boring 08-TB-03 for mercury due to missed holding times.

There are no constituents detected at this SWMU with concentrations that exceed the residential or industrial RBCs. The maximum detected concentration mercury of 20.2 mg/kg in soil samples collected at this SWMU exceeds the default USEPA SSL of 2 mg/kg. The 20.2 mg/kg mercury concentration is calculated based on the average concentration of sample N08-GP094-0002A (27.9 mg/kg) and its duplicate (12.4 mg/kg).

The concentration of mercury exceeds the USEPA SSL of 2 mg/kg in only 3 of the 14 soil samples from this SWMU. In order to further evaluate the potential soil to groundwater migration pathway, a site specific SSL was developed for mercury as discussed in the following subsection.

A SSL was derived for SWMU 8-16 using site-specific information to further evaluate if mercury detected at a concentration exceeding the USEPA SSL has the potential to migrate to groundwater at a level of concern. As indicated, the maximum detected concentration of mercury (20.2 mg/kg) does not exceed the site-specific SSL of 1,156 mg/kg for SWMU 8-16.

Comparison of mercury concentrations and detection limits to Region III RBCs for industrial and residential soil shows there is no concern related to the soil contact pathways. Comparison of the mercury soil analytical data to the site-specific SSL indicates that there is no concern related to the migration of this constituent from soil to groundwater at this SWMU. As a result, no further action is warranted for SWMU 8-16.

SWMU 9-1: STORAGE FACILITY/HOPPER

SWMU 9-1, the bottom/fly ash storage facility is utilized as a temporary storage and truck loading area for bottom/fly ash. Final disposal of ash is on-site in landfill Cell J5. The area has a paved loading area (approximately 65 feet by 25 feet) with 6-inch diked walls along a concrete base. The concrete base slopes toward drains for surface water collection. The area is used to load ash into trucks for transportation to disposal Cell J-5. The area is adjacent to the Bottom/Fly Ash Lagoon and Power House Road. This unit was installed in 1974.

The investigation of this site consisted of soil sampling during Phase 2 of the RI. Three Geoprobe borings (09-GP-01, 09-GP-02, and 09-GP-03) were advanced into the subsurface at SWMU 9-1. All three borings were advanced to the proposed depth of 5 ft-bgs and samples were collected for laboratory analysis from the surface (0 to 2 ft-bgs) and shallow subsurface (3 to 5 ft-bgs). Seven samples (including a duplicate sample) were submitted to RECRA for analysis of TAL inorganics, PAHs, boron, and pH.

One inorganic constituent (arsenic) had a maximum detected concentration exceeding the USEPA SSL. No organic constituents have maximum detections exceeding SSLs. Arsenic and beryllium concentrations slightly exceed the Region III RBCs for industrial soil. Iron and benzo(a)pyrene concentrations exceed the RBC for residential soil only.

No constituents have detection limits that exceed the USEPA SSLs. Two organic constituents have maximum detection limits that exceed the Region III RBCs for industrial soil, while an additional three constituents have detection limits that exceed the RBCs for residential soil only. Arsenic detections exceed the USEPA SSL in the 0 to 2 ft-bgs interval of each boring. Arsenic concentrations are generally highest in the 3 to 5 ft-bgs samples. The detection of beryllium exceeding the industrial RBC is in the surface sample collected from 09-GP-02.

A site-specific SSL was derived for SWMU 9-1 to further evaluate whether arsenic detected at concentrations exceeding the USEPA SSL has the potential to migrate from soil to groundwater at levels of concern. The maximum detected concentration of arsenic was then compared to the site-specific SSL. This comparison revealed that the maximum detected concentration of arsenic does not exceed the site-specific SSL.

SWMU 9-2: FORMER BOTTOM/FLY ASH LAGOON (SOUTH OF POWERHOUSE)

SWMU 9-2, the former bottom/fly ash lagoon, lies south of the powerhouse adjacent to the Ohio River. This unit no longer accepts bottom/fly ash. The dimensions of the unit are approximately 320 feet by 120 feet. The lagoon is diked with earthen material and is sparsely vegetated along the banks. It lies within the 100 year floodplain and is parallel to the Ohio River. Harbor dredging material is currently deposited in this unit.

The investigation of SWMU 9-2 was completed during Phase 2 of the RFI. Four borings (09-TB-01 through 09-TB-04) were advanced into the subsurface using a HSA drill rig and continuous split-spoon sampling at SWMU 9-2. All four borings were advanced to the proposed depth of 20 ft-bgs and samples were collected from the surface (1 to 3 ft-bgs), shallow subsurface (3 to 5 ft-bgs) and deep subsurface (18 to 20 ft-bgs in 09-TB-01 and -02; 19 to 20 ft-bgs in 09-TB-03, due to saturated soil from 18 to 19 ft-bgs; and 17 to 18 ft-bgs in 09-TB-04 due to saturated soil above and below). Thirteen samples (including a duplicate sample) were submitted to RECRA and analyzed for the TAL inorganics, TCL PCBs/pesticides, boron, pH, and TOX.

One organic compound (alpha-BHC) and three inorganic analytes (arsenic, beryllium and lead) have maximum detected concentrations that exceed the Region III RBCs for both industrial and residential soil. One organic compound (beta-BHC) and three inorganic analytes (barium, iron, and manganese) have maximum detected concentrations that exceed RBCs for residential soil only.

Four organic compounds (alpha-BHC, beta-BHC, delta-BHC and gamma-BHC) and four inorganic constituents (arsenic, barium, chromium and thallium) have maximum detected concentrations exceeding the default USEPA SSLs.

The two occurrences of alpha-BHC exceeding the Region III industrial RBC are in the shallow subsurface samples (3 to 5 ft-bgs) from borings 09-TB-03 and 09-TB-04. Delta-BHC exceeds the SSL in the shallow subsurface sample from boring 09-TB-04 and in the surface sample from boring 09-TB-02. The occurrence of lead exceeding the 800 mg/kg screening criterion is from the shallow subsurface sample and its duplicate from boring 09-TB-02. Other constituents that exceed screening criteria were from various borings and depths. As discussed in the following section, SWMU 9-2 is further evaluated using site-specific SSLs.

Eight organic compounds have maximum detection limits that exceed Region III RBCs for industrial and residential soil. Four organics have maximum detection limits that exceed RBCs for residential soil only. The maximum detection limit for PCBs is slightly higher than desirable, but this is only in a single sample (NO9-TB001-0002). The remaining samples have reasonable PCBs detection limits and PCBs were not detected at this SWMU. Therefore these constituents are not considered to be of concern.

SSLs were derived for this SWMU using site-specific data to further evaluate if the constituents detected at concentrations exceeding the USEPA SSLs have the potential to migrate from soil to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs. The comparison of constituent concentrations to site-specific SSLs revealed that alpha- and beta-BHC exceeded the site-specific SSLs.

The data set for this SWMU was sorted to evaluate soils to which an industrial worker (0 to 2 feet) could be exposed. An evaluation for a construction scenario was not performed, as there would be no excavation or repair work occurring at the SWMU. This data set was compared to the Region III RBCs for industrial soil. The results of the comparison show only arsenic and beryllium exceeding the industrial RBC in the 0 to 2 ft-bgs interval.

SWMU 9-2 once contained bottom/fly ash generated in the on-site power plant, but is currently used as a dredge pond. This material has average concentrations of arsenic and beryllium slightly above background concentrations. Therefore, these constituents were identified as COIs for SWMU 9-2 and a site-specific risk assessment was performed for the industrial worker scenario.

The results of the site-specific risk assessment for SWMU 9-2 indicate that the hazard index and theoretical excess lifetime cancer risk for an industrial worker are 0.007 and 1×10^{-6} , respectively. These results are within the acceptable targets (hazard index of one or less, and risks within the range of 10^{-6} and 10^{-4}) according to the USEPA (1989a).

No further action is recommended for SWMU 9-2. Although the analytical results for SWMU 9-2 show concentrations of constituents that exceed USEPA industrial RBCs, the results of the site-specific risk assessment indicate that hazards and risks are within acceptable limits for the industrial worker. Based upon this evaluation, no further action is warranted at this SWMU for the direct contact pathway. However, this SWMU has been included in the USEPA approved Institutional Control Plan as a precautionary measure to ensure worker safety.

The conservative site-specific SSL calculation indicated there are several organic constituents present at this SWMU that could potentially migrate from soil to groundwater at levels exceeding conservative risk-based criteria. However, the groundwater in the sand and gravel outwash beneath SWMU 9-2 area is contained through on-site pumping. Flow is predominantly inland toward the pumping wells, or vertically downward into the hydraulically contained sand and gravel unit. In addition, on-site drinking water is treated before use and tested frequently. As a result, there are no complete exposure pathways for groundwater. Therefore, no further action is warranted for groundwater at SWMU 9-2.

SWMU 9-3: BOTTOM/FLY ASH LAGOON

SWMU 9-3, the bottom/fly ash lagoon, is used as a settling pond for fly ash slurry that is pumped from the adjacent power station. Wastewater from this unit discharges to NPDES permitted Outfall 004. The dimensions of the lagoon are approximately 375 feet by 110 feet. The unit is equipped with earthen dikes and lies within the 100 year floodplain.

SWMU 9-3 was investigated during Phase 2 of the RFI. Four borings (09-TB-05 through 09-TB-08) were completed using a HSA drill rig and continuous split-spoon sampling methods. All four borings were advanced to 20 ft-bgs and samples were collected from the surface (0 to 2 ft-bgs), shallow subsurface (3 to 5 ft bgs) and deep subsurface (18 to 20 ft-bgs). Thirteen samples (including a duplicate sample) were submitted to RECRA and analyzed for the TAL inorganics, boron, and pH.

There are two inorganic constituents (arsenic and thallium) with maximum detected concentrations exceeding the USEPA SSLs. In addition, arsenic and beryllium were detected at concentrations slightly exceeding the Region III RBCs for industrial and residential soil, while iron was detected at a concentration exceeding the RBC for residential soil only.

No constituents have maximum detection limits that exceed the USEPA SSLs. No constituents have maximum detection limits exceeding the Region III RBCs for residential or industrial soils.

USEPA, PPG, and ICF Kaiser held a telephone conference call on October 16, 1997 to discuss the RFI data collected for SWMU 9-3. In the telephone conference call, USEPA agreed that no further action is necessary for SWMU 9-3 pending review of average arsenic in natural versus bottom/fly ash material. A memorandum dated November 3, 1997 to USEPA provided the averages.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. In addition, although maximum detected concentrations of arsenic and beryllium exceed the industrial RBCs, these concentrations were not considered to be of concern because they are within an active unit and site workers are trained on the chemical hazards associated with flyash. As a result, no further action is warranted in SWMU 9-3. As a precautionary measure, PPG has included this SWMU as part of the facility's Institutional Control Plan.

SWMU 9-4: COAL PILE RUNOFF COLLECTION SYSTEM

The coal pile runoff collection system, installed in 1991, is a clay lined pond that collects runoff from the adjacent coal piles. After collection, this runoff water is pumped and treated for pH at the lead/asbestos treatment system.

Four Geoprobe borings (09-GP-04 through 09-GP-07) were advanced into the subsurface at SWMU 9-4. All four borings were advanced to 5 ft-bgs and samples were collected for laboratory analysis from the surface (0 to 2 ft-bgs) and shallow subsurface (3 to 5 ft-bgs). Eight samples were submitted to RECRA for analysis of TAL inorganics, boron, and pH.

Six soil borings (4 hand and 2 Geoprobe™ borings) were completed during Phase 3 of the RFI. Samples were collected at depths of 0 to 2, 3 to 5, and 20 to 22 ft-bgs from boring 09-GP-08 and at depths of 0 to 2, 3 to 5 and 16 to 18 ft-bgs from boring 09-GP-09. Samples from these two borings were analyzed by Quanterra for arsenic and lead.

Samples were collected at depths of 0 to 2 ft-bgs and 4 to 6 ft-bgs in hand boring 09-HB-03. The sample collected from a depth of 0 to 2 ft-bgs was analyzed by Quanterra for arsenic and lead. The samples from 09-HB-01, 09-HB-02, 09-GP-09 and the sample collected at a depth of 4 to 6 ft-bgs from 09-HB-03 were analyzed by Quanterra for lead.

Six inorganics (antimony, arsenic, barium, cadmium, mercury, and thallium) were detected with maximum concentrations exceeding the default USEPA SSLs. No constituents had maximum detection limits exceeding USEPA SSLs.

Three inorganic constituents (arsenic, beryllium and lead) were detected at maximum concentrations which exceeded the Region III RBCs for both industrial and residential soils, while two inorganics (barium and iron) had maximum detected concentrations which exceeded the RBCs for residential soil only. No constituents had detection limits exceeding RBCs.

SSLs were derived for SWMU 9-4 using site-specific data to further evaluate if the constituents detected at concentrations exceeding the USEPA SSLs could potentially migrate to groundwater at levels of concern. The maximum concentration of these constituents were then compared to the site-specific SSLs.

Only mercury had a maximum detection which slightly exceeded the site-specific SSL for this SWMU. However, the average mercury concentration using only the detected concentrations is 0.84 mg/kg, which is below the SSL. All of the other constituents had maximum detections which were below the site-specific SSLs.

USEPA, PPG, and ICF Kaiser held a telephone conference call on February 25, 1998 to discuss the scope of additional work needed at SWMU 9-4. Arsenic and lead were identified as the two constituents of interest for this SWMU, as the maximum detected concentrations exceeded the industrial screening criteria. Although the maximum detected concentration of beryllium also exceeded the industrial RBC, this was the only detection (out of eight samples) which exceeded, and the concentration of 1.4 mg/kg was consistent with background levels.

Additional samples were collected at SWMU 9-4 in order to determine if the single lead concentration greater than 800 mg/kg was representative of the SWMU or an isolated, anomalous concentration. The samples were also collected to determine if the arsenic and lead concentrations were associated with coal material near the surface. The results of the sampling show that the highest concentrations of lead and arsenic at SWMU 9-4 are associated with coal from the active coal pile. The lead concentrations exceeding RBCs are isolated occurrences, and the average concentrations are below these screening criteria. Based on these results, USEPA agreed in a second telephone conference call held on May 14, 1998 that no further action is warranted for SWMU 9-4.

Although the maximum detected concentrations of arsenic, beryllium, and lead exceed the screening criteria for industrial soil, they are not considered to be of concern. Arsenic and lead concentrations are associated with the active coal pile. Lead concentrations exceeding RBCs are isolated, and the average is less than the screening criteria. Beryllium was detected only once at a concentration exceeding the industrial RBC, and this detection is consistent with background levels. For these reasons, no further action is warranted at SWMU-9-4 for the soil contact pathways. As a precautionary measure, PPG is including this SWMU in the facility's institutional control plan.

SWMU 10-1: INORGANICS WASTE POND

The Inorganics Waste Pond was a settling unit that accepted waste sludge from the old barium oxide process (1962 - 1972). The wastes deposited in this unit include BaCO_3 , BaSO_4 , FeO , and SiO_2 . When the pond filled with settled sludge, the sludge was removed annually and disposed at Fly Ash Landfill Cells J1 and J2. The Inorganics Waste Pond was constructed of excavated earthen walls with dimension of approximately 225 feet by 140 feet and a capacity of 7,000 cubic yards. Prior to 1942, gravel mining operations occurred in the area. The gravel pit, which was approximately 50 to 60 feet deep, was filled with borrow material from an unknown source in the early fifties. A small area of this pit was re-excavated and used as the Inorganics Waste Pond. This unit is currently vegetated with grass. The VI (IT, 1992) reported the presence of several inorganic compounds (e.g., barium, chromium, and lead) in monitoring wells adjacent to this SWMU.

To accelerate the RFI/CMS process, SWMU 10-1 was investigated during May 1994. Two soil borings were drilled and soil samples collected for laboratory analysis within the limits of the pond. Six confirmatory borings were drilled along the suspected edge of the pond to visually determine whether the location was inside or outside the pond area. During a second round of investigations in October 1994, four Geoprobe borings were drilled outside the suspected edge of the pond to collect soil samples. The findings of the two rounds of investigations, including analytical results, were presented to the USEPA in the "Interim Action and Investigation Report for Selected RFI SWMUs and AOCs" (ICF Kaiser, 1996b). A separate executive summary document was also submitted to USEPA to assist the review process (ICF Kaiser, 1996i).

One inorganic constituent (barium) has a maximum detected concentration exceeding the USEPA SSL. In addition, arsenic and beryllium concentrations slightly exceed the Region III RBCs for both industrial and residential soil. Barium, iron, and manganese concentrations exceed Region III RBCs for residential soil only. Total petroleum hydrocarbons were detected at a maximum concentration exceeding the screening criteria. However, detections of individual constituents associated with TPH (e.g., BTEX and PAHs) were all below the RBCs.

Barium concentrations exceed the USEPA SSL in four out of 15 samples tested for this analyte. The soil borings inside the former pond limits show elevated concentrations in surface samples, a decrease in levels in shallow (3 to 5 ft-bgs) subsurface samples, and then an increase in concentrations at depth. Along the perimeter of the pond, concentrations are present at elevated levels in surface samples and then decrease significantly in shallow subsurface samples.

Arsenic concentrations exceed the Region III industrial RBC in all 7 samples tested for this parameter, although at concentrations consistent with the average background value of 7.7 mg/kg. Beryllium was detected at concentrations exceeding the Region III industrial RBC in 3 of 15 samples. The detections were one each in a surface sample (10-GP-04), shallow subsurface sample (10-GP-01), and deep subsurface sample (10-TB-01). The average concentration of beryllium, however is similar to the average background value of 0.6 mg/kg.

In addition, one inorganic, two VOCs and nine SVOCs had maximum detection limits that exceed USEPA SSLs. Three SVOCs had maximum detection limits which exceeded Region III RBCs. An evaluation of the detection limits for samples collected in SWMU 10-1 revealed that none of the detection limits were elevated above those normally achievable by the analytical methods used. Additionally, there is no evidence that any of the constituents with detection limits exceeding the screening criteria may be present in this SWMU.

A site-specific SSL was derived for SWMU 10-1 to further evaluate whether barium detected at concentrations exceeding the USEPA SSL has the potential to migrate from soil to groundwater at levels of concern. The maximum detected concentration of barium was then compared to the site-specific SSL. The maximum detected concentration of barium does not exceed the site-specific SSL.

USEPA, PPG, and ICF Kaiser held a telephone conference call on December 5, 1997 to discuss the RFI data collected at SWMU 10-1. In the telephone conference call, USEPA agreed that no further action is necessary for SWMU 10-1 pending comparison of arsenic concentrations to additional background soil sample data.

Comparison of soil analytical data to site-specific SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. In addition, although the maximum detected concentrations of arsenic and beryllium exceed the industrial RBCs, the average

detections are consistent with background levels and therefore the soil contact pathways are not a concern. As a result, no further action is warranted for SWMU 10-1.

SWMU 10-2: SEWER SYSTEM FOR THE FORMER BARIUM AND TiCL₄ PLANTS

SWMU 10-2 consists of the sewer system associated with the former Barium and TiCL₄ Plants. These sewers accepted wastewater generated during the production in this area. The only potential release from these units is through leaks or releases. However, there is no documented evidence that these units have leaked or released any contaminants into the environment.

Eighteen Geoprobe borings (10-GP-08 through 10-GP-25) were advanced into the subsurface at SWMU 10-2. Borings 10-GP-08 through 10-GP-16, 10-GP-20 and 10-GP-25 were placed along sewers servicing the former TiCL₄ plant and borings 10-GP-17 through 10-GP-19 and 10-GP-21 through 10-GP-24 were placed along sewers servicing the former Barium plant. Each boring was advanced to a depth of 2 feet below the sewer. Boring 10-GP-25, the deepest, was advanced to 12 ft-bgs. A total of fifty-four samples (including duplicates) were submitted to RECRA for analysis of TAL inorganics, chloride, sulfide, pH, and TPH.

The Phase 3 investigation of SWMU 10-2 consisted of 4 soil borings (10-GP-42 through 10-GP-45). Surface samples (0-2 ft-bgs) were collected from borings 10-GP-42 and 10-GP-44. Samples were collected from the 0 to 2 and 8 to 10 ft-bgs in 10-GP-43. The samples from 10-GP-45 were collected from the 0 to 2 and 3 to 5 ft-bgs intervals. These samples were collected in locations which demonstrated elevated TPH in Phase 2 samples. The samples were analyzed for TCL VOCs, TCL SVOCs, and TPH in order to identify constituent-specific data needed to evaluate risks to human health.

Two inorganics (arsenic and beryllium) and total petroleum hydrocarbons have maximum detected concentrations which exceeded the Region III RBCs for both industrial and residential soil, while three inorganics (barium, iron and manganese) and one SVOC (benzo(a)pyrene) had maximum detected concentrations which exceeded the RBCs for residential soil only.

No constituents have maximum detection limits that exceed the Region III RBCs for industrial soil; however, one inorganic constituent and four organic constituents had maximum detection limits that exceed the Region III RBCs for residential soil. In addition, thirteen organic constituents have maximum detection limits that exceed the default USEPA SSLs. However, the detection limits are within those normally achievable by the analytical methods and are not considered elevated.

As discussed in the following subsections, the groundwater migration pathway for SWMU 10-2 is further evaluated using site-specific SSLs.

SSLs were derived for this SWMU using site-specific data to further evaluate if the constituents detected in soil have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the default USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs. There were no constituents with maximum detected concentrations exceeding the site-specific SSLs.

The data set for SWMU 10-2 was sorted to evaluate soils to which an industrial worker (0 to 2 feet) and a construction worker (0 to 5 feet) could be exposed. These data sets were compared to the Region III RBCs for industrial soil. The results of these comparisons show only arsenic, beryllium and total petroleum hydrocarbons, exceed the industrial RBC in both depth intervals.

Although the analytical results for SWMU 10-2 show concentrations of constituents that exceed the USEPA industrial RBCs, most of the constituent concentrations exceeding the industrial RBCs are at depths at which direct soil contact will not occur. Analysis of surface and shallow subsurface soil samples shows only arsenic, beryllium, and total petroleum hydrocarbons with concentrations greater than Region III RBCs. The mean detection of arsenic and beryllium at this SWMU are within background concentrations and industrial and construction activities do not currently occur at this SWMU. Therefore, it is highly unlikely for an industrial or construction worker to come in contact with contaminated soils. Based upon this evaluation, no further action is warranted at this SWMU for soil contact pathways in an industrial setting.

The comparison to the conservative site-specific SSL calculation shows that there are no constituents present at concentrations that will migrate from the soil to groundwater at levels of concern. As a result of these findings, no further action is warranted for SWMU 10-2.

SWMU 10-3: PROCESS SEWERS FOR INORGANICS AREA

SWMU 10-3 consists of the process sewers located in the inorganics area. The sewer system in this area is constructed of a concrete encased fiberglass reinforced plastic pipe. This system was installed in 1990. Wastes managed include a strong process wastewater with a high sulfide concentration and a weak process wastewater with a lower sulfide concentration. The strong process wastewater is sent to the calcium hypochlorite plant. The weak wastewater is pumped to the pH collection system and then flows to NPDES permitted Outfall 009.

The investigation of SWMU 10-3 was performed during Phase 2 of the RFI. Sixteen Geoprobe borings (10-GP-26 through 10-GP-41) were advanced into the subsurface at SWMU 10-3. Each boring was advanced to a depth two feet below the sewer. Boring 10-GP-37, the deepest, was advanced to 11 ft-bgs. Boring 10-GP-35 was drilled by hand rather than the Geoprobe due to access limitations caused by surrounding tanks and overhead piping. A total of forty seven samples (including duplicates) were submitted to RECRA for analysis of TAL inorganics, chloride, sulfide, and pH.

Four inorganic constituents (barium, chromium, mercury, and nickel) had maximum detected concentrations exceeding the USEPA SSLs. No constituents had maximum detection limits exceeding USEPA SSLs.

Arsenic and beryllium concentrations slightly exceed the Region III RBCs for industrial and residential soil, while two inorganics (barium and iron) exceed RBCs for residential soils only. There are no constituents with maximum detection limits exceeding the Region III RBCs for residential or industrial soil.

The concentration of mercury exceeds the USEPA SSL in the 3 to 5 ft-bgs interval samples from 10-GP-30. Other analytes exceeding the screening criteria are at various borings and depths.

In order to further evaluate the soil to groundwater migration pathway, site-specific SSLs were developed. SSLs were derived for SWMU 10-3 using site-specific data to further evaluate if the constituents detected at concentrations exceeding the USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs. The results indicated that no constituents with maximum detected concentrations exceeded the site-specific SSLs.

USEPA, PPG, and ICF Kaiser held a telephone conference call on November 18, 1997 to discuss the RFI data collected for SWMU 10-3. In the telephone conference call, USEPA agreed that no further action is necessary for SWMU 10-3.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. In addition, although arsenic and beryllium have been detected at concentrations exceeding the industrial RBCs, the average detections are consistent with background levels. As a result, there is no concern with the direct contact pathways and no further action is warranted at SWMU 10-3.

AOC 10-1A: SOIL IN THE INORGANICS AREA

AOC 10-1A includes all of the soil in the Inorganics Process Area. No documentation was available identifying the extent and/or location of potential releases in this area.

AOC 10-1A was investigated during Phase 2 of the RFI via a subsurface sampling program. Five borings (10-TB-03 through 10-TB-07) were advanced into the subsurface using a HSA drill rig and continuous split-spoon sampling at AOC 10-1A. Four of the five borings were advanced to 20 ft-bgs and samples were collected for laboratory analysis from the surface (0 to 2 or 1 to 3 ft-bgs, depending on ground cover), shallow subsurface (3 to 5 ft-bgs) and deep subsurface (18 to 20 ft-bgs). The fifth boring was advanced to 21 ft-bgs and the deep subsurface sample was collected from 19 to 21 ft-bgs. Boring 10-TB-03 was moved approximately 65.5 feet west due to buried high pressure natural gas lines in the vicinity of the initially proposed location. Sixteen samples (including a duplicate sample) were submitted to RECRA and analyzed for the TAL inorganics, TPH, pH, TOX, sulfide, and chloride.

Shelby tube samples were collected from the 3 to 5 ft-bgs instead of the proposed shallower interval due to the presence of asphalt and subbase material or other field observations and 16 to 18 ft-bgs intervals in boring 10-TB-04. Shelby tubes were also collected at the 3 to 5 ft-bgs and 16 to 19 ft-bgs intervals in 10-TB-05. The Shelby tube samples were analyzed for the geotechnical/general engineering parameters, TOC, CEC, grain size distribution, hydrometer, bulk density, permeability, and moisture content.

Only arsenic and barium have maximum detected concentrations exceeding the USEPA SSLs. No constituents have maximum detection limits exceeding USEPA SSLs.

The maximum detection of arsenic exceeds the RBCs for industrial and residential soil, and an additional two inorganic constituents (beryllium and iron) have detected concentrations that exceed the Region III RBCs for residential soil only. No constituents have maximum detection limits exceeding Region III RBCs.

The concentrations of arsenic exceeds the USEPA SSL in the surface samples in boring 10-TB-07. However, the average value of arsenic at this SWMU is similar to background concentrations. The highest concentrations of barium are in the surface samples from 10-TB-03, 10-TB-04, 10-TB-06, and 10-TB-07, but all are lower than the industrial RBC. Concentrations in these four borings decrease with increasing depth.

SSLs were derived for AOC 10-1A using site-specific data to further evaluate if the constituents detected at concentrations exceeding the USEPA SSLs have the potential to migrate from soil to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs.

There were no constituents with maximum detected concentrations exceeding the site-specific SSLs.

USEPA, PPG, and ICF Kaiser held a telephone conference call on November 4, 1997 to discuss the RFI data collected for AOC 10-1A. In the telephone conference call, USEPA agreed that no further action is necessary for AOC 10-1A pending approval of the final site-specific SSLs (which was received on January 22, 1998).

Comparison of soil analytical data to site-specific SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this AOC. In addition, although some detected concentrations of arsenic exceed the industrial RBC and background levels, mean detected concentrations are similar to the background range, and therefore arsenic would not increase risk to a worker through soil contact pathways. As a result, no further action is warranted in AOC 10-1A.

AOC 10-2A: OIL/TiCL₄ STORAGE TANKS

These ten aboveground tanks were initially used to store TiCL₄ and later for oil storage. They were contained with earthen dike walls composed of silty clay and gravel. The tanks were each about 75 feet long and 10 feet in diameter. The ten tanks were removed in March of 1993. Soil and gravel are present at the ground surface in this area.

Two rounds of investigation (May and October 1994) were conducted at AOC 10-2A on a voluntary, accelerated schedule by PPG. The results of the investigation were provided to USEPA in a document entitled "Interim Action and Investigation Report For Selected RFI SWMUs and AOCs" (ICF Kaiser, 1996b) and an executive summary document (ICF Kaiser, 1996j). The investigation at this AOC indicated that the concentrations of constituents of potential concern in soil are below the USEPA SSLs and Region III RBCs.

Based on this information AOC 10-2A is recommended for no further action.

SWMU 11-1: CAL-HYPO REAGENT PREPARATION AREA

SWMU 11-1, the Cal-Hypo Reagent Prep Area, stores filter cake material containing CaCO₃, CaSO₄, and elemental sulfur. Until November 1992, these materials were stored in bins and dumpsters prior to disposal in the Cal-Hypo landfill. Currently, this material is shipped off-site for disposal. The dumpsters are located within a secondary concrete containment structure.

SWMU 11-1 was investigated as part of the Phase 2 RFI. Four Geoprobe borings (11-GP-01 through 11-GP-04) were advanced into the subsurface at SWMU 11-1. All four borings were advanced to 5 ft-bgs and soil samples for laboratory analysis were collected from the surface (0 to 2 ft-bgs) and shallow subsurface (3 to 5 ft-bgs). Nine soil samples (including a duplicate) were submitted to RECRA for analysis of sulfide, chloride, calcium, and sodium.

USEPA, PPG, and ICF Kaiser held a telephone conference call on September 12, 1997 to discuss the RFI data collected at SWMU 11-1. In the telephone conference call, USEPA agreed that no further action is necessary for SWMU 11-1. This SWMU requires no further action because it has no detected constituents or detection limits that exceed the Region III RBCs or USEPA SSLs.

The parameters of interest in soil at SWMU 11-1 do not present concern related to soil contact or migration to groundwater. Calcium, sodium and chloride are present, but do not pose an unacceptable risk

since they are innocuous constituents and essential nutrients. As a result, no further action is warranted in SWMU 11-1.

SWMU 12-1: PELS® AREA PROCESS SEWER

SWMU 12-1 consists of the PELS® sump collection system, which was installed in 1990. This system consists of a PVC coated steel piping network and concrete sumps. All wastewaters entering this system are pumped back to the caustic process area for recovery. Cooling water used for the PELS® process is sent for pH adjustment via a separate sewer system and discharged to NPDES permitted Outfall 012. Prior to installation of this system, wastewater from PELS® was collected in the old TiO₂ sump system and discharged directly to the Ohio River. Wastewater containing anhydrous sodium hydroxide beads, cooling water and washwaters are collected in this system.

SWMU 12-1 was investigated during Phase 2 of the RFI. Five Geoprobe borings (12-GP-01 through 12-GP-05) were advanced into the subsurface at SWMU 12-1. Each boring was advanced to a depth two feet below the base of the sewer. Boring 12-GP-05, the deepest, was advanced to 13 ft-bgs. A total of sixteen samples (including duplicates) were submitted to RECRA for analysis of pH and sodium.

The soil pH values range between 4.8 and 12.3; however, these values do not present a concern from a health perspective because they are localized and not high or low enough to be irritating. There are no Region III RBCs or USEPA SSLs for the parameters analyzed at this SWMU.

USEPA, PPG, and ICF Kaiser held a telephone conference call on September 12, 1997 to discuss the RFI data collected at SWMU 12-1. In the telephone conference call, USEPA agreed that no further action is necessary for SWMU 12-1. This SWMU requires no further action because it has no detected constituents or detection limits that exceed the Region III RBCs or USEPA SSLs.

The parameters of interest in soil at SWMU 12-1 do not present concern related to soil contact or migration to groundwater. Sodium is present but does not pose unacceptable risk because it is an innocuous constituent and essential nutrient. Also, the observed pH values present no concerns related to the soil contact pathways. As a result, no further action is warranted in SWMU 12-1.

SWMU 12-2: PELS BULK LOADING AREA

SWMU 12-2 consists of the PELS® loading area. This area is used for loading PELS® and solid NaOH tablets, into railroad hopper cars. A sump collection system was installed around 1980. The product is a solid, and spillage is easily contained and collected. This unit was put into operation in 1975.

SWMU 12-2 was investigated during Phase 2 of the RFI. Samples were collected from three Geoprobe borings (12-GP-06 through 12-GP-08). All three borings were advanced to 5 ft-bgs and samples were collected from the surface (0 to 2 ft-bgs) and shallow subsurface (3 to 5 ft-bgs). Six samples were submitted to RECRA for analysis of sodium and pH.

The soil pH values range between 10.3 and 11.8; however, these values do not present a concern from a health perspective because they are localized and not high or low enough to be irritating. There are no Region III RBCs or USEPA SSLs for the parameters analyzed at this SWMU.

USEPA, PPG, and ICF Kaiser held a telephone conference call on September 12, 1997 to discuss the RFI data collected at SWMU 12-2. In the telephone conference call, USEPA agreed that no further action is necessary for SWMU 12-2. This SWMU requires no further action because it has no detected constituents or detection limits that exceed the Region III RBCs or USEPA SSLs.

SWMU 13-1: BARIUM LANDFILL

The barium landfill was used for disposal of solid wastes generated during the operation of the barium carbonate/chloride plant. This waste disposal unit was constructed of excavated earthen sides and base. The unit accepted about 20 million pounds of BaCO_3 , BaSO_4 , FeO , and SiO_2 . The dimensions are approximately 200 feet by 200 feet with a capacity of approximately 5,500 cubic yards. Wastes were disposed in this unit for one year only, 1963. The landfill is located within the 100 year floodplain of the Ohio River. The area is currently soil covered and vegetated. The VI (IT, 1992) reported lead and barium present in monitoring wells near this SWMU.

SWMU 13-1 was investigated during Phases 1 and 2 of the RFI. The Phase 1 scope of work at SWMU 13-1 consisted of an electromagnetic survey (RFI Phase 1, Task 1) conducted in the fall of 1995. The entire field area is interpreted to be composed of background values. The Phase 1 Technical Memorandum concluded that either there is no buried waste in the field area or, if present, the conductivity of the waste is the same as background.

The Phase 2 scope of work consisted of a subsurface soil sampling program. Five borings (13-TB-03 through 13-TB-07) were advanced into the subsurface using a HSA drill rig and continuous split-spoon sampling at SWMU 13-1 (Figure 6.60-1). All five borings were advanced to 20 ft-bgs and samples were collected from the surface (0 to 2 or 1 to 3 ft-bgs, depending on ground cover), shallow subsurface (3 to 5 ft-bgs) and deep subsurface (18 to 20 ft-bgs). Sixteen samples (including a duplicate sample) were submitted to RECRA for analysis of TAL inorganics.

Two inorganic constituents (barium and mercury) have maximum detection limits exceeding the USEPA SSLs. Two inorganic constituents (arsenic and beryllium) have detected concentrations exceeding the Region III RBCs for industrial soil, and an additional three (barium, iron, and lead) have detected concentrations that exceed RBCs for residential soil only.

The highest concentrations of barium are found in the surface and/or shallow subsurface samples from each boring. Barium concentrations decrease significantly in the deep subsurface samples, with two exceptions. At 13-TB-04, the highest concentration is in the surface sample, a significant decrease is observed in the shallow subsurface sample, and then an increase is observed in the deep subsurface sample. Boring 13-TB-05 exhibits a concentration in the deep subsurface sample that is only slightly lower than the surface sample. The sample with mercury concentrations exceeding the SSL was the shallow subsurface sample collected from boring 13-TB-04.

Ten of the detections of arsenic at concentrations exceeding the RBC are from surface and shallow subsurface samples and two are from deep subsurface samples (borings 13-TB-04 and 13-TB-07). The two detections of beryllium exceeding the RBC are shallow subsurface samples collected from borings 13-TB-03 and 13-TB-04. The average concentration of arsenic and beryllium of this SWMU is similar to those detected in background samples.

SSLs were derived for SWMU 13-1 using site-specific data to further evaluate if the constituents detected at concentrations exceeding the USEPA SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceed the USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs. Results of this comparison revealed that there are no constituents with maximum detected concentrations exceeding the site-specific SSLs.

USEPA, PPG, and ICF Kaiser held a telephone conference call on November 4, 1997 to discuss the RFI data collected at SWMU 13-1. In the telephone conference call, USEPA agreed that no further action is necessary for SWMU 13-1.

Comparison of the soil analytical data to the RBCs and background concentrations show there is no concern related to the soil contact pathways at this SWMU. Comparison of soil analytical data to site-specific SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. As a result, no further action is warranted for SWMU 13-1.

SWMU 13-2: TITANIUM OXIDE PONDS

The TiO₂ ponds were a series of settling ponds for inert material from the TiO₂ plant, which operated from 1968-1971. The unit was inactive from 1971 until it was closed in August 1980. These ponds were constructed with clay floors and walls. Dimensions were approximately 200 by 200 feet by up to 18 feet deep and contain approximately 2,500 tons of waste sludge. The area where the unit existed is covered with soil and gravel and is partially vegetated with grass. .

SWMU 13-2 investigation consisted of an EM survey performed during Phase 1 and a soil sampling program conducted during Phase 2 of the RFI. An EM survey (RFI Phase 1, Task 1) was conducted at SWMU 13-2 in the fall of 1995 (ICF Kaiser, 1996d). The terrain (quadrature phase) and in-phase conductivity maps for this SWMU show high magnitude terrain and in-phase conductivity values in the center of the field area. The contours form two trench-like features which are interpreted to correspond to the area of the TiO₂ Ponds.

Two borings (13-TB-08 and 13-TB-10) were advanced into the subsurface using a HSA drill rig and continuous split-spoon sampling at SWMU 13-2. Both borings were advanced to 30 ft-bgs and samples were collected from the surface (0 to 2 ft-bgs), shallow subsurface (3 to 5 ft-bgs) and deep subsurface (26 to 28 ft-bgs in 13-TB-08, 28 to 30 ft-bgs in 13-TB-10). Seven samples (including a duplicate sample) were submitted to RECRA and analyzed for the TAL inorganics.

One inorganic constituent (arsenic) has a maximum detected concentration that exceeds the Region III RBCs for both industrial and residential soil. The average concentration of arsenic is similar to the background concentrations. Three inorganic constituents (beryllium, iron and mercury) have maximum detected concentrations that exceed the RBCs for residential soil only. Land use at the PPG Natrium facility is clearly industrial and will remain so for the foreseeable future.

A site specific SSL was derived for this SWMU to further evaluate if the concentrations of mercury exceeding the USEPA SSL have the potential to migrate from soil to groundwater. Maximum detected concentrations of mercury were compared to the site-specific SSLs. The result of this comparison revealed that the maximum detected concentration of mercury does not exceed the site-specific SSL.

Although the analytical results for SWMU 13-2 shows concentrations of arsenic that exceed the USEPA industrial RBCs, the maximum detected concentration of this constituent is near the calculated background value, and average detections are well within normal background concentrations. This SWMU is in an area removed from current plant activities, therefore, it is highly unlikely for an industrial or construction worker to come in contact with soils. In addition, comparison of analytical data to site-specific SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater. For these reasons, the potential for soil exposure to workers is extremely unlikely and would not pose unacceptable risk. Based upon this evaluation, no further action is warranted at this SWMU.

SWMU 13-3: FORMER BHC STORAGE PILE LOCATION

The BHC waste storage pile stored approximately 330,000 pounds of BHC isomers per year along with trace amounts of chlorinated organic solvent wastes. The pile was in operation from 1952-1962. The

solid waste and constituent-containing soil were removed and disposed off-site in a secure landfill in 1977. The historical limits of the pile are not well defined. The pile's dimensions were approximately 75 feet by 150 feet and could potentially store about 1,900 cubic yards of BHC. Surface soils in the area consist of fill material (silty clay), gravel, and slag. The area is about 50 percent vegetated with grass, brush, and weeds. The area is located within the 100 year flood plain of the Ohio River. The VI (IT, 1992) reported chlorinated VOCs and lead in groundwater samples collected from wells near this SWMU.

Five borings (13-TB-15, -16, -18, -20, and -21) were advanced into the subsurface using a HSA drill rig and continuous split-spoon sampling at SWMU 13-3. The borings were advanced to 20 ft-bgs and samples were collected from the surface (0 to 2 ft-bgs), shallow subsurface (3 to 5 ft-bgs) and deep subsurface (18 to 20 ft-bgs). Sixteen samples (including a duplicate sample) were submitted to RECRA and analyzed for the TAL metals, TCL VOCs, TCL SVOCs, and TCL pesticides.

Thirty nine (39) soil borings were completed to delineate the occurrence of BHC and an additional 15 soil borings (13 Geoprobe™ and 2 hand borings) were completed to delineate the occurrence of lead concentrations exceeding the industrial RBCs.

A total of 160 samples, including duplicates, were collected and screened for alpha, beta, gamma, and delta BHC. Kemron performed the BHC screening analysis on an accelerated basis. Fifteen (15) samples, plus 1 duplicate sample, were collected as split samples and were analyzed by Quanterra for TCL pesticides to confirm the results of the BHC screening analysis.

Two sampling events were conducted at SWMU 13-3 after completion of the Phase 3 sampling program. These samples were collected for two reasons: 1) to further delineate the near surface BHC concentrations between 13-GP-54 and 13-GP-57, and 2) to further delineate the BHC concentrations in the vicinity of 13-GP-66.

Twenty-two organic constituents and four inorganic constituents have maximum detected concentrations that exceed the USEPA default SSLs. Six organic constituents and two inorganic constituents were detected at concentrations that exceed the Region III RBCs for both industrial and residential soil, and three organics and one inorganic have maximum detected concentrations that exceed the RBCs for residential soil only.

The BHC isomers were detected at the greatest frequency and magnitude of all constituent classes. The boring locations with the highest detections of these constituents are N13-TB015, -TB018, -TB020, and TB-021; all were from the shallow soil samples (between 0 and 5 feet). In addition to the four BHC isomers, arsenic, lead, benzene, and tetrachloroethene were detected at concentrations exceeding the industrial RBCs. A number of VOCs, SVOCs, and inorganics were also detected at concentrations exceeding the USEPA default SSLs.

SSLs were derived for SWMU 13-3 using site-specific data to evaluate whether the constituents detected at concentrations exceeding the USEPA default SSLs have the potential to migrate to groundwater at levels of concern. Site-specific SSLs were calculated for each constituent that exceeded USEPA SSLs. Maximum detected concentrations were then compared to the site-specific SSLs. The result of this comparison revealed that eleven organic constituents have maximum detected concentrations exceeding the site-specific SSLs.

The data set for SWMU 13-3 was sorted to evaluate soils to which an industrial worker (0 to 2 feet) and a construction worker (0 to 5 feet) could be exposed. These data sets were compared to the Region III RBCs for industrial soil. The results of these comparisons show that seven constituents exceed the Region III RBCs for industrial soil in the 0 to 2 ft-bgs data set: alpha-, beta-, delta-, and gamma-BHC, arsenic,

lead, and benzene. For the 0 to 5 ft-bgs data set, tetrachloroethene was detected above the industrial RBC, in addition to those constituents listed above. These constituents were identified as COIs for SWMU 13-3. Therefore, site-specific risk assessments were performed for both the industrial worker and construction worker scenarios.

Due to the nature of this SWMU, contact by site workers does not occur on a daily basis. Therefore, the standard exposure factor for a worker of 250 days/year (USEPA, 1991) is inappropriate and overly conservative. Therefore, the exposure frequency has been adjusted to 100 days/year (two days per week; 50 weeks per year, which is still quite conservative) for the industrial worker.

The results of the site-specific risk assessment for SWMU 13-3 indicate that the hazard index and theoretical excess lifetime cancer risk for an industrial worker are 47 and 8×10^{-3} , respectively. The hazard index and theoretical excess lifetime cancer risk for a construction worker are 200 and 3×10^{-3} , respectively. These results exceed the acceptable targets (hazard index of one or less, and risks within the range of 10^{-6} and 10^{-4}) according to the USEPA (1989a).

USEPA, PPG, and IT/ICF Kaiser held a series of telephone conferences to discuss the RFI results for SWMU-13-3. In these discussions, PPG agreed to submit a corrective action proposal for the COIs in SWMU 13-3 soil. PPG's proposed corrective action, an engineered soil cover with shoreline erosion protection, was submitted to USEPA in letters dated June 2, 1999 and June 25, 1999. USEPA acknowledged the proposed corrective action as acceptable in a letter to PPG dated July 1, 1999. In addition to soil cover and shoreline protection, the accepted plan includes implementation of an Institutional Control Plan which restricts activities within the SWMU area

The site specific risk assessment results exceed the acceptable targets (hazard index of one or less, and risks within the range of 10^{-6} and 10^{-4}) according to the USEPA (1989a). Following discussions held with USEPA it was concluded that a USEPA approved/engineered soil cap and riverbank stabilization would be installed as the corrective action. Impacted soil excavation, cap construction and riverbank stabilization activities were completed in August 2000. The SWMU 13-3 area is also subject to a USEPA-approved Institutional Control Plan which restricts access and ground disturbing activities within the designated area.

SWMU 13-4: SEWERS INSIDE AND SURROUNDING PAINT SHOP AREA

SWMU 13-4 consists of the concrete trenches located inside of the Paint Shop Area that collect wash waters and spills. This SWMU also includes the sewer associated with the trenches. The sewer consists of reinforced concrete pipe which discharges to NPDES Outfall 012.

The investigation of SWMU 13-4 was performed during Phase 2 of the RFI and consisted of a soil sampling program. Six Geoprobe borings (13-GP-06 through 13-GP-11) were advanced into the subsurface at SWMU 13-4. Each boring was advanced to a depth of 10 ft-bgs (two feet below the sewer). A total of nineteen samples (including duplicates) were submitted to RECRA for analysis of metals, TCL VOCs, TCL SVOCs, and TOX.

Analytical results revealed barium with a maximum detected concentration exceeding the USEPA SSL. One inorganic constituent (arsenic) has a maximum detected concentration that exceeds both the Region III RBCs for industrial and residential soil. Barium has a maximum detected concentration that exceeds the RBC for residential soil only.

A site-specific SSL was derived for SWMU 13-4 to further evaluate whether barium detected at levels exceeding the USEPA SSL has the potential to migrate from soil to groundwater at levels of concern. The

maximum detected concentration of barium was then compared to the site-specific SSL. This comparison revealed that the maximum detected concentrations of barium do not exceed the site-specific SSL.

USEPA, PPG, and ICF Kaiser held a telephone conference call on December 5, 1997 to discuss the RFI data collected for SWMU 13-4. In the telephone conference call, USEPA agreed that no further action is necessary for SWMU 13-4.

Comparison of soil analytical data to the RBCs and background concentration shows there is no concern related to the soil contact pathway. Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. As a result, no further action is warranted for SWMU 13-4.

SWMU 13-6: OIL STORAGE TANK AREA (FOR #2 BRINE FIELD DEVELOPMENT)

The oil storage tank area is the location of two former above ground storage tanks, which were approximately 20 feet long and 8 feet in diameter. This unit was in existence from 1952 until its removal in 1991. The tanks held well development oil for brine field No. 2. Capacities of each tank were approximately 7,500 gallons. No secondary containment existed when the tanks were in use. The area is currently vegetated with grass and weeds.

Two rounds of investigation (May 1994 and October 1994) were conducted at SWMU 13-6 on a voluntary accelerated schedule by PPG. The results of the investigation were provided to USEPA in a document entitled "Interim Action and Investigation Report for Selected RFI SWMUs and AOCs" (ICF Kaiser, 1996b). Eleven soil borings were completed in this area in two phases. The first phase consisted of 2 soil borings (13-TB-01 and 13-TB-02) with samples collected at depths of 0 to 0.5, 3 to 5 ft-bgs. These samples were analyzed for TPH, TOX, and PCBs. The second phase consisted of 9 soil borings completed to a maximum depth of 15 feet. Samples collected from the second phase were field screened for TPH.

Only TPH has a maximum detected concentration exceeding the 1,000 mg/kg screening value for industrial and residential soil. There are no organic constituents that have maximum detection limits that exceeds the RBCs for residential soil or industrial.

USEPA, PPG, and ICF Kaiser held a meeting on May 28, 1997 at Region III headquarters. In that meeting, USEPA provided PPG with an internal memorandum (September 30, 1996) that concurred with PPG's recommendation for no further action. The reason stated by USEPA for the no further action decision is the Phase II soil sample results that show no detectable VOCs or SVOCs.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. The investigation found TPH present at this SWMU, but no individual constituents that exceed USEPA SSLs or Region III residential or industrial RBCs. As a result, there is no concern related to the soil contact pathways, and no further action is warranted at SWMU 13-6.

AOC 13-1A: DRIP GAS DRUM STORAGE AREA

The drip gas drum storage area was removed in late 1996. The drip gas drum storage area was enclosed on three sides with corrugated metal sheeting. The drums were placed on wooden pallets set on a concrete floor with a 6-inch concrete dike. Prior to installation of the concrete floor and dike, the drums were placed directly on the ground surface. The DOCC reported absorbent material was present on the floor within the diked area and several drums of "used absorbent" were located outside of the facility.

Dimensions of the storage area were 12 feet by 18 feet. The area surrounding the building was comprised of gravel with some soil. The DOCC reported staining is evident in this area. This unit was installed in 1992.

This unit was investigated during Phases 2 and 3 of the RFI.

One Geoprobe boring (13-GP-12) was advanced into the subsurface at AOC 13-1A. The boring was advanced to the proposed depth of 5 ft-bgs and samples were collected from the surface (0 to 2 ft-bgs) and shallow subsurface (3 to 5 ft-bgs). Three samples (including a duplicate) were submitted to RECRA for analysis of TPH, TOX, and sulfide.

Three soil borings (13-GP-26, 13-GP-27, and 13-GP-28) were completed at AOC 13-1A during Phase 3 of the RFI. Samples were collected at depths of 0 to 2, 3 to 5, 7 to 9, and either 10 to 12 or 11 to 12 ft.-bgs. The samples were analyzed by Quanterra for TPH, VOCs, and SVOCs.

Only TPH was detected at a concentration that exceeds the 1,000 mg/kg screening value for industrial and residential soil. However, the concentration of specific constituents of concern typically associated with TPH (i.e., BTEX or PAHs) do not exceed the Region III RBCs for industrial and residential soil. This finding is consistent with site-wide TPH data, which show low VOCs and SVOCs concentrations even when TPH is in the tens-of-thousands mg/kg range. One constituent (benzene) has a maximum detected concentration that exceeds the USEPA default SSL.

A site-specific SSL was derived for AOC 13-1A to further evaluate whether benzene detected at levels exceeding the USEPA default SSL has the potential to migrate from soil to groundwater at levels of concern. The maximum detection of benzene was then compared to the site-specific SSL. The results of this comparison revealed that the maximum detection of benzene does not exceed the site-specific SSL.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. The investigation found TPH present at this SWMU, but no individual detected constituent concentrations associated with TPH (such as BTEX or PAHs) exceed USEPA SSLs or Region III RBCs. Therefore, comparison of constituent concentrations to the screening criteria shows there is no concern related to the soil contact or soil to groundwater migration pathways. As a result, no further action is warranted at AOC 13-1A.

SWMU 14-2: CS₂ AREA PROCESS SEWERS

The CS₂ process sewer system, SWMU 14-2, was installed in 1964 during the construction of the CS₂ facility. The system is entirely contained within concrete trenches. All wastewaters flow through an internal oil/water underflow weir prior to connecting with the MCB storm sewer system. Discharge to the Ohio River occurs through NPDES Outfall 009.

SWMU 14-2 was investigated during Phase 2 of the RFI. Eighteen Geoprobe borings (14-GP-01 through 14-GP-17 and 14-GP-25) were advanced into the subsurface at SWMU 14-2. Five of the 18 borings, 14-GP-13 through 14-GP-17, were drilled along the common sewer leading to NPDES Outfall 009. Boring 14-GP-25 was drilled in the MCB area along the sewer leading from the CS₂ production area. Each boring was advanced to a depth 2 feet below the sewer, trench, or drain. Boring 14-GP-25, the deepest, was advanced to 16 ft-bgs. A total of 59 samples (including duplicates) were submitted to RECRA for analysis of TCL VOCs, TCL SVOCs, TPH, reactivity, and flammability.

Total petroleum hydrocarbon concentrations exceed the Region III RBCs for industrial and residential soil. However, the specific constituents of concern typically associated with TPH (i.e., BTEX or PAHs)

were not detected at concentrations greater than the industrial RBCs. The maximum detected concentration of benzo(a)pyrene slightly exceeds the residential RBC, but it is infrequently detected. Three organic constituents (1,1,2,2-tetrachloroethane, tetrachlorethene and 2,4-dinitrotoluene) have maximum detected concentrations exceeding the USEPA SSLs.

The concentration of 1,1,2,2-tetrachloroethane exceeds the USEPA SSL in the duplicate surface sample from boring 14-GP-03. The concentration of 2,4-dinitrotoluene exceeds the USEPA SSL in the surface sample of 14-GP-01. Tetrachloroethene exceeds the USEPA SSL in the surface and shallow subsurface samples from boring 14-GP-14 and also in the shallow subsurface and 8 to 12 ft-bgs samples from 14-GP-25 in the MCB area.

An evaluation of the detection limits for samples collected in SWMU 14-2 revealed that none of the detection limits were elevated above the acceptable detection limits for the analytical methods used. Additionally, there is no evidence that any of the constituents with detection limits exceeding the screening criteria may be present in this SWMU.

SSLs were derived for SWMU 14-2 using site-specific data to further evaluate if the constituents detected at concentrations exceeding the USEPA SSLs have the potential to migrate from soil to groundwater. Site-specific SSLs were calculated for each constituent that exceeds the USEPA SSL. Maximum detected concentrations of constituents were then compared to the site-specific SSLs. The results of this comparison revealed that there are no constituents with maximum detected concentrations exceeding the site-specific SSLs.

USEPA, PPG, and ICF Kaiser held a telephone conference call on November 6, 1997 to discuss the RFI results for SWMU 14-2. USEPA agreed in the telephone conference call that no further action is necessary for SWMU 14-2.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. The investigation identified TPH present at this SWMU, but no individual constituents that exceed Region III industrial RBCs; therefore, there is no concern related to the soil contact pathways. As a result, no further action is warranted for SWMU 14-2.

AOC 14-1A: SOIL IN CS₂ PROCESS AREA 14-1A: SOIL IN CS₂ PROCESS AREA

Carbon disulfide (CS₂) releases have been documented in the CS₂ process area. Heat exchangers are cleaned in an open area where a CS₂ condensate tank once stood. The DOCC reported a large dark stain (approximately 200 ft²) covers the unpaved, gravel-covered ground surface.

Four Geoprobe borings (14-GP-18 through 14-GP-21) were advanced into the subsurface at AOC 14-1A during Phase 2 of the RFI. Each Geoprobe boring was advanced to a depth of 5 ft-bgs and samples were collected from the surface (0 to 2 ft-bgs) and shallow subsurface (3 to 5 ft-bgs). In addition, one boring (14-TB-01) was advanced into the subsurface using a HSA drill rig and continuous split-spoon sampling. The HSA boring was advanced to 7 ft-bgs and samples were collected from the surface and shallow subsurface. Ten samples were submitted to RECRA for analysis of TCL VOCs, TCL SVOCs, reactivity, and flammability.

Detected constituent concentrations in soil samples collected from this AOC do not exceed the Region III residential or industrial RBCs. Detected constituent concentrations also do not exceed the default USEPA SSLs. The detection limit for three SVOCs exceed the Region III RBCs for residential soil and detection limits for several VOCs and SVOCs exceed the default USEPA SSLs. However, the detection limits for

these constituents are within those normally achievable by the analytical method and are not considered elevated.

USEPA, PPG, and ICF Kaiser held a telephone conference call on November 6, 1997 to discuss the RFI data collected at AOC 14-1A. In the telephone conference call, USEPA agreed that no further action is necessary for AOC 14-1A.

Comparison of soil analytical data to SSLs indicates that there is no concern related to migration of detected constituents from soil to groundwater at this AOC. Also, comparison of the analytical data to Region III residential and industrial RBCs shows there is no concern related to the soil contact pathways. As a result, no further action is warranted for AOC 14-1A.

AOC 14-2A: CS₂ TANK CAR LOADING AREA

The CS₂ tank car loading area is located along the western side of the CS₂ process area. Railroad tank cars are loaded with finished product from overhead pipes for shipment off-site. There are no structures or other facilities to contain spills in the loading area.

The investigation of AOC 14-2A was performed during Phase 2 of the RFI and consisted of a soil sampling program. Three Geoprobe borings, numbers 14-GP-22, -23, and -24, were advanced into the subsurface at AOC 14-2A. Samples were collected from the surface (0 to 2 ft-bgs) and shallow subsurface (3 to 5 ft-bgs). Six samples were analyzed for TCL VOCs, TCL SVOCs, reactivity, and flammability.

No constituents are present with a maximum detected concentration exceeding the USEPA SSL. Three VOCs and nine SVOCs have maximum detection limits which exceed the USEPA SSLs.

Benzo(a)pyrene was detected at concentrations that exceed the Region III RBCs for residential soil in one of six samples. No constituents were detected at concentrations that exceed the RBCs for industrial soil.

USEPA, PPG, and ICF Kaiser held a telephone conference call on November 6, 1997 to discuss the RFI data collected for AOC 14-2A. In the telephone conference call, USEPA agreed that no further action is necessary for AOC 14-2A.

Comparison of the soil analytical data for AOC 14-2A with the SSLs shows that constituents will not migrate from soil to groundwater at levels of concern. Also, comparison with the Region III industrial RBCs shows there is no concern related to the soil contact pathway. As a result, no further action is warranted for AOC 14-2A.